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Digitization Guidelines for Static & Non-static (Audiovisual) Media: Compliance & Challenges in Academic Libraries

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DIGITIZATION GUIDELINES FOR STATIC & NON-STATIC (AUDIOVISUAL) MEDIA: COMPLIANCE & CHALLENGES IN ACADEMIC LIBRARIES

by

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ABSTRACT

DIGITIZATION GUIDELINES FOR STATIC & NON-STATIC (AUDIOVISUAL)
MEDIA: COMPLIANCE & CHALLENGES IN ACADEMIC LIBRARIES

by

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This doctoral dissertation aims to explore digitization practices at academic libraries in the

United States. It examines adopted digitization guidelines, levels of compliance with these

guidelines, challenges, and solutions. It seeks answers to five research questions in relation to

academic libraries' compliance with static and non-static (audiovisual) media digitization

guidelines, encountered challenges, and applied solutions. A mixed methods explanatory

research design was adopted for this comparative study. Purposive sampling was applied. The

study sample consisted of 68 subjects from doctoral universities with highest and higher research

activity based on the 2015 classification issued by *The Carnegie Classification of Institutions of

Higher Education*. Quantitative and qualitative data were gathered through three collection

methods: document analysis, electronic questionnaire, and semi-structured interviews. Document

analysis was conducted for five sets of digitization guidelines (i.e., ALCTS, BCR's CDP Digital

Imaging Best Practices Working Group, CARLI, FADGI, and NARA), wherein one (i.e.,

CARLI) consisted of five documents. Open coding was applied to explore themes in qualitative

data collected by the electronic questionnaire and semi-structured interviews. The Wilcoxon

Signed Ranks Test was applied to examine differences between digitization of static and non-static (audiovisual) media regarding challenges, levels of compliance, availability, and usefulness. The Paired Samples Test was applied only for sets of quantitative data that have normal distribution. Findings revealed differences in the adoption of digitization guidelines for digitizing static and non-static (audiovisual) media. *Consistency, Standardization, and Sustainability* was the most frequent type of reason for compliance with digitization guidelines adopted for static and non-static (audiovisual) media. *Planning and Workflow* was the most frequent type of reason for not complying with digitization guidelines adopted for static media, whereas *Hardware* was the most frequent type of reason for not complying with digitization guidelines for non-static (audiovisual) media. Statistical analyses revealed no significant differences in levels of compliance, availability, and usefulness between static and non-static (audiovisual) media among ALCTS, consortium/consortia, and a university's own customized digitization guidelines. Open coding indicated that *Funding* and *Hardware* challenges appeared among the three most frequent types of challenges for static and non-static (audiovisual) media. The Wilcoxon Signed Ranks Tests revealed significant differences (with the exception of external funding) between digitization of static and non-static (audiovisual) media in terms of budget, digitization equipment/hardware, digitization software, staff digitization skills, and the need for more professional training. Different types of applied and suggested solutions were explored, wherein *Planning and Workflow* and *Funding* solutions were most frequent among the applied and suggested solutions for static and non-static (audiovisual) media. The theoretical implications of this study focus on digitization guidelines and compliance levels with those guidelines, and digitization challenges. Practical implications aim to provide suggestions to

enhance development of digitization guidelines, and to reduce the effect of challenges faced in digitizing static and non-static (audiovisual) media.

To my mother and brother Mohammad

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Chapter 1 Introduction

1.1. Background

Conway (1996) described our world as a digital one, providing examples such as using the keyboard as communication tool. Digital information is changing the way people learn, communicate, and think (Smith, 1999b). "Print is not always the best way to record and disseminate information" (Arms, 2000, p. 6). "For some materials, digital versions are going to be all the user needs" (Lesk, 1997, p. 26). This movement toward digital forms of life affects many aspects, such as dealing with information in many sectors in the community, including libraries. Libraries are moving towards creating and disseminating information electronically (Smith, 1999a). Converting materials to digital formats or cooperating with publishers to facilitate online availability of these materials are activities conducted by university libraries (Arms, 2000).

Born digital records and those reformatted from analog resources are increasing significantly (Sanett, 2013). Indeed, today's world is well-known for rapid changes and developments. Users need to access information regardless of the geographical or temporal boundaries. However, the analog format of valuable resources residing on shelves are not serving the purposes of online access and delivery. In addition, the time poses a threat on these valuable materials, highlighting the necessity of digitization.

Lee (2001) mentioned that the 1990s represents the decade of digitization, a trend that continued during the 2000s. Conway (1996) discussed that imaging is not limited to creating a precise picture of a book or map, instead it involves a transformation of the concept of format.

Keneley, Potter, West, Cobbin, and Chang (2016) revealed that multiple asynchronous usages are applicable through digitization, so both temporal and spatial relationships between records and researchers are shifted as a result of enhanced access via digitization to archival records. In other words, digitization has facilitated wider access to rare and special collections (Falk, 2003). This demonstrates that digitization can serve as a link between the user and the resource, a new dimension for access to information.

Saving written content is made easier through the use of digital technology, which increases the availability of more information (Lesk, 1997). Digitization protects fragile documents by reducing their handling, and can provide the feature of searching for items electronically (Pandey & Misra, 2014). Preserving valuable materials, as well as improving preservation and access are the main reasons for digitization (Abd Manaf & Ismail, 2010). For instance, the content of deteriorating negatives can be captured through digitization in order to provide future access to them as indicated by Matusiak and Johnston (2014). Consequently, it is clear that digitization serves access and preservation.

Regarding digitization within a particular context, many studies have focused on digitization practices at academic libraries (Iwhiwhu & Eyekpegha, 2009; Lampert & Vaughan, 2009; Pandey & Misra, 2014; Potter & Holley, 2010). Academic libraries have valuable information resources in different scientific domains. A variety of materials are digitized by university libraries: coins, music, art, children's literature, other countries' artifacts, and newspapers' archives (Liu, 2004). It is clear that digitization is important nowadays in many contexts, especially in academic settings such as universities and their libraries, which deal with researchers and information seekers.

This reality results in a need to explore the digitization practices conducted within the same context by similar types of institutions. In other words, there is a need to explore the adopted digitization guidelines utilized and best practices identified by academic libraries in the United States as they undertake digitization projects. Such exploration helps in figuring out whether or not there exist unified digitization guidelines to understand their designs and provide suggestions for enhancing them. Also, challenges encountered can be explored, which may facilitate the recommendation of appropriate solutions to successfully address them. This doctoral dissertation fills the gap in identifying the adopted digitization best practices, particularly digitization guidelines adopted by academic libraries in the United States that their universities were listed in the 2015 classification issued by *The Carnegie Classification of Institutions of Higher Education*. The compliance level with these digitization guidelines reported by the sample examined will also be investigated. In addition, challenges encountered in the digitization effort will be explored in order to suggest the appropriate solutions.

1.2. Definitions of Key Terms

This section introduces definitions for the key terms used in this doctoral dissertation. Definitions were derived from different references, including general dictionaries, specialized dictionaries, glossaries, and specialized literature. This variety of references helps in understanding how a particular term is interpreted in different contexts. Examples and explanations can be found in the following sub-sections (Sections 1.2.1.-1.2.5.) in this chapter.

1.2.1. Guideline

Even though this section is referring to the term *guideline* directly, it aims to explain the terms *standard,* and *best practice(s)* as well. Many digitization documents available online use different terms and expressions such as guidelines and best practices (Section 2.1.4.). Chapter Four of this doctoral dissertation includes a document analysis for nine digitization documents (Sections 4.1.1.1. and 4.1.1.2.). These documents were issued by different sources (Section 3.3.1.). During the analysis process, it was noticed that the titles of the examined digitization documents have different terms, such as guidelines and best practices. The term guidelines will be used for this doctoral dissertation, whereas the terms used by cited literature and researchers will be introduced as they are. However, clear agreement is important to understand the meanings of these terms in order to understand the concept of digitization best practices, guidelines, and standards.

Dictionaries were consulted in order to provide definitions to explain the meaning of these key terms. The term *guideline* was defined by Rooney (2004) in *Bloomsbury English Dictionary* as "an official recommendation indicating how something should be done or what sort of action should be taken in a particular circumstance" (p. 827). Specialized dictionaries provided other definitions for the term guideline(s) as well. For example, Reitz (2004) explained the term guidelines in the *Dictionary for Library and Information Science* as "Recommended procedures for accomplishing a given task or achieving a set of goals and objectives, formulated by a body with authority to speak on the subject but less binding than the formal *standards* used in evaluation and assessment" (p. 325).

Moreover, the literature provided different definitions to clarify the meaning of a particular term for the reader. For instance, Besser (2003) defined *standards* as "Formal structures, procedures, and tools designed to promote uniformity and predictability. Typically developed, adopted, and promoted by large organizations that can advocate for their broad usage. Data standards enable the exchange of data, while technology standards enable the delivery of data between systems" (p. 82). Recently, Perrin (2016) described the digitization standard as "a document created to ensure that items in a particular project meet an established minimum standard for capture" (p. 66).

Further, the term best practice(s) is defined in different information resources such as dictionaries. For example, Hornby (2005) explained it in the *Oxford Advanced Learner's Dictionary of Current English* as "a way of doing sth [*sic*] that is seen as a very good example of how it should be done and can be copied by other companies or organizations" (p. 133). Also, a specialized dictionary introduced the same expression based on a specific context, which is library and information science. Reitz (2004) interpreted best practices in the *Dictionary for Library and Information Science* as the following:

> In the application of theory to real-life situations, procedures that, when properly applied, consistently yield superior results and are therefore used as reference points in evaluating the effectiveness of alternative methods of accomplishing the same task. Best practices are identified by examining the empirical evidence of success. (p. 66).

Conway (2008) said in his article regarding the best practices to digitize photographs "A guideline is only as valuable as the extent to which its recommendations are adopted beyond the organization that make them" (p. 101). However, Druery, McCormack, and Murphy (2013)

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indicated that there is an absence of a standard meaning for the term best practices among professionals, who are using this term in spite of its frequency in the literature of library and information science.

Indeed, identifying explicit definitions for best practices in the context of library and information science was challenging. Instead, definitions from other contexts were found in order to represent an almost similar concept. Peters and Heron (1993) indicated that in many contexts, the term best practice is used to identify strategies that are obviously superior based on the experts' points of view. Bretschneider, Marc-Aurele Jr., and Wu (2004) said regarding the implication of the term best practice that "it is best when compared to any alternative course of action and that it is a practice designed to achieve some deliberative end" (p. 309). However, in the context of accounting, Bragg (2013) indicated that any improvement added onto existing systems is considered a best practice.

It became clear that the expression best practice(s) occurs in various contexts. Although there is an absence of consensus regarding a single definition, there is general agreement among all the previously discussed definitions. This lies in considering best practice as the best method, strategy, or way of doing a particular action. Each definition introduced an explanation fitting a particular context. After examining the previous definitions, none directly refers to digitization.

It is important to realize that standards and best practices are not the same. Official standards organizations like ISO (International Standards Organization) and NISO (National Information Standards Organization) develop standards as explained by Abbas (2010). On the other hand, both standards developers and community users who use the standards are responsible for the development of best practices (Abbas, 2010). "If the best practice proves

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useful within the community or information agency, it may be suggested as an addition or provision of an existing standard or as the basis for a new standard" (Abbas, 2010, p. 64).

After all, there is a need to develop a precise definition for the term guidelines, which fits more perfectly to the scope of this doctoral dissertation. For the purpose of this doctoral dissertation, the expression *digitization guidelines* is defined as the best recommendations in regard to the technical specifications and strategies adopted to efficiently digitize various types of analog items including both static and non-static (audiovisual) media in order to facilitate access and preservation to the created digital objects in the future. It is obvious that this developed definition connects between the concepts of digitization and digital preservation. As a consequence, this definition might be limited in its scope, because it is tailored to the context and aim of this doctoral dissertation.

1.2.2. Digitization

Rooney (2004) defined the term *digitize* in *Bloomsbury English Dictionary* as "to convert an image, graph, or other data into digital form for processing on a computer" (p. 522); in addition, the term *digitization* was mentioned as a derivative word within the same headword. Specialized dictionaries in the area of library and information science have introduced more precise definitions based on this particular context since the 20th century. Watters (1992) explained digitization in the *Dictionary of Information Science and Technology* as the following:

> the process of converting nondigital information to a digital format. In communication this is the process of converting analog signals to digital signals. In information systems digitization often refers to the process of converting an image (such as a photograph or

map), using some type of scanning device (or digitizer), into digital representation so that it can be displayed on a screen and/or manipulated. (p. 65).

Furthermore, Pearce-Moses (2005) interpreted the term digitization in *A Glossary of Archival and Records Terminology* as "The process of transforming analog material into binary electronic (digital) form, especially for storage and use in a computer." (p. 120).

Many researchers in the area of library and information science undertook/expended considerable efforts to define the term digitization. Various definitions were created during the intervening years in order to provide clarity. The efforts of Lee (2001), Besser (2003), and Hughes (2004) provide examples of early trials to define the concept of digitization. Lee (2001) interpreted digitization as "the conversion of an analog signal or code into a digital signal or code" (p. 3), while Besser (2003) defined the term *digitizing* as "The process of deriving **digital objects** from **analog** originals by converting their **sampled** values to binary code" (p. 72, emphasis original). Later, Hughes (2004) clarified digitization as "the process by which analogue content is converted into a sequence of 1s and 0s and put into a binary code to be readable by a computer" (p. 4).

Definitions of digitization were shaped not only by expert individuals in the field. Specialized institutions also participated in shaping these definitions. Many institutions are dealing with digitization, making it necessary to clarify the meaning of the term. The Institute of Museum and Library Services (2006) defined digitization as "the process of converting, creating, and maintaining books, art works, historical documents, photos, journals, etc., in electronic representation so they can be viewed via computer and other devices" (p. 13).

Other researchers also came up with many definitions to explain this term. Fatoki (2007) interpreted digitization as "a process towards building digital libraries, which involves taking traditional library materials, typically in the form of books and papers, and converting them to electronic form, where they can be stored and manipulated by a computer" (p. 15). Additionally, Beagrie and Jones (2008) stated digitization as "The process of creating digital files by scanning or otherwise converting analogue materials" (p. 25). Recently, Paul and Singh (2014) clarified digitization as "the process of transforming the information from documents such as a printed book, picture or video into bits" (p. 221). Caro (2016) referred to digitization as "scanning" in her book and described it as one of the first steps taken to create a digital collection.

Overall, it became obvious that most of the previously discussed definitions share similarities. First, digitization mainly refers to converting. Second, the conversion process is from analog into digital form. Third, facilitating computer processing to handle and manipulate the created digital objects is the goal of such conversions. Fourth, enabling viewing of the digitized items electronically is another goal of digitization. Since the scope of this doctoral dissertation focuses on the process of digitizing analog media for preservation and access purposes, a single definition, introduced by Pearce-Moses (2005), is adopted for this doctoral dissertation. There are three reasons for choosing this definition. First, this definition stated that digitization is a process. Second, conversion took the form of an action that transformed analog materials into digital form. Third, the purpose of such a transformation is facilitating both storage and use through using a computer.

1.2.3. Static and non-static (audiovisual) media

This doctoral dissertation discusses the digitization of both static and non-static (audiovisual) media. Therefore, it is important to understand the meaning of three terms: media, static, and non-static (audiovisual). Many specialized glossaries provided different definitions to clarify the meanings of these terms. For instance, the term *media* in the *ALA Glossary of Library and Information Science* is defined as "*Materials* or tools in all *formats* … and all channels of communication upon which *information* can be recorded, stored, or transmitted" (Media, 2013, p. 164).

After gaining an understanding of the meaning of the term media, it became crucial to realize the meanings of static and non-static (audiovisual) media. The term *static* was briefly defined in the *Random House Webster's Easy English Dictionary: Intermediate* as "not moving or changing" (Static, 2001, p. 425). Printed books, manuscripts, photographs, maps, and journals are examples of static media (Xie & Matusiak, 2016). Within the context of this doctoral dissertation, static media refers to materials such as books, photographs, posters, maps, newspapers, and manuscripts.

Gilmour (2006) mentioned in *Collins English Dictionary & Thesaurus* that the term *non* is a prefix that refers to negation. Further, Walter (2005) indicated the usage of the prefix non in *Cambridge Advanced Learner's Dictionary* as "to add the meaning 'not' or 'the opposite of' to adjectives and nouns" (p. 856). Therefore, non-static is opposite to the concept of and term static media as explained in the previous paragraph. Audio and video are examples of dynamic media (Xie & Matusiak, 2016). In other words, non-static media refers to materials such as audio/voice recordings and analog videos based on the scope of this doctoral dissertation.

The differences between static and non-static media can be clearly understood by examining the *Minimum Digitization Capture Recommendations*, submitted by (Bogus, Blood, Dale, Leech, & Mathews, 2013). In this online document, different materials were classified by Bogus et al. (2013) into two categories, which are either "Static" or "Time-Based Media." Rare books, manuscripts, maps, microforms, art on paper, three-dimensional objects, and photographic processes are examples of static media that were mentioned by Bogus et al. The second category that was mentioned by Bogus et al. is the time-based media which included audio, moving image film, and video. For a better differentiation, the time element that exists in time-based media makes this media different than other analog materials as clarified by Bogus et al. (2013). For the purpose of this doctoral dissertation, materials are classified as static or non-static (audiovisual) media.

1.2.4. Master and derivative files

Understanding the meaning of *master*, *access*, and *derivative* files is important in the context of digitization. Specialized guidelines in digitization usually discuss different types of files. Based on the scope of this doctoral dissertation, it is crucial to differentiate between these types of files for a better understanding of digitization literature and guidelines. Besides, this doctoral dissertation contains document analysis of a number of digitization guidelines, which discuss different types of files in more details (Sections 4.1.1.1. and 4.1.1.2.). Digitization projects specify the technical details of these types of digital files to accommodate project-specific objectives and ambitions.

Master and access files differ in their concepts and usage purposes. Frey and Reilly (2006) defined *digital master* thusly: "It represents the highest quality file that has been digitized … the main issues in creating the digital master relate to longevity and quality" (p. 3). On the contrary, Besser (2003) interpreted an access file as: "A file derived from a **master file** that is used to make a **digital** collection item accessible without hazarding the master. Typically compressed to reduce **storage** requirements and speed **online** delivery" (p. 67, emphasis original).

However, Frey and Reilly (2006) explain the meaning of a derivative file as "….the files for daily use. Speed of access and transmission and suitability for certain purposes are the main issues to consider in the creation of derivative files" (p. 3). Moreover, Lee (2001) defined a derivative as "any object (analog or digital) derived from the *master* digital image produced in the scanning process" (p. 89). Besser (2003) clarified the meaning of a derivative file as: "A file derived or created from another file, rather than created during an original digitization process. Differs from a copy insofar as the derivative file may be altered in some way from the original" (p. 71).

1.2.5. Challenge

Challenge is another key term within the context of this doctoral dissertation. Landau (2000) defined the term *challenge* in the *Cambridge Dictionary of American English* as "something needing great mental or physical effort in order to be done successfully, or the situation of facing this kind of effort" (p. 133). Furthermore, this term was explained in the *Random House Webster's Easy English Dictionary: Intermediate* as "something that is difficult

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to accomplish and that tests a person's skill or ability, esp. in an interesting way" (Challenge, 2001, p. 66). After all, there are many challenges facing digitization, but this dissertation is focusing only on three types of challenges: funding, technology, and staff skills. Based on the discussed challenges discussed within this dissertation, the definition provided by Challenge (2001) is adopted on account of its simplicity.

1.3. Research Problem, Questions, and Hypotheses

The lifespan of papers was reduced to decades instead of centuries as a result of using acid-process wood pulp, alum-rosin sizes, and chemical bleach (Lesk, 1997). "High temperatures and relative humidity accelerate the chemical processes that lead to embrittlement and fluctuations in either or both of those environmental factors add additional stress to books" (Smith, 1999a, p. 4). Also, Lesk (1997) mentioned that there are no surviving copies for 15% of the books published during the 18th century by Cambridge University Press. Even though papers can last for a relatively long period of time in some cases, other types of materials might not be capable of lasting for a similar time period due to disasters or data loss. In many cases, these materials may differ in their characteristics and expected lifespan. Digitization may help in providing continued access and preservation to print materials.

Information exists in different materials that can be found in libraries, archives, museums, or other similar environments. The content of these materials contains valuable information that stored in different types of materials such as, but not limited to: manuscripts, maps, posters, microfiche, rare books, photographs, audio recordings, and moving images. Digitization plays a principal role in providing access to the content of different materials for

future use through creating digital objects. Therefore, digitization plays a main role in storing and disseminating this information.

Digitization involves many standards, principles, and practices that need to be clarified and understood. The Federal Agencies Digitization Guidelines Initiative (FADGI) has provided many guidelines explaining the digitization process, outlining the many steps that must be followed for digitization workflow planning, such as: defining the requirements, assessing organizational capabilities, project management, and developing the workflow plan. Moreover, the digitization workflow plan introduced by FADGI (2016) demonstrated that some activities conducted are before the actual digitization step (e.g., selection and condition evaluation), whereas other activities are performed after the digitization step (e.g., quality review and archiving). It is understood from this statement that digitization is not a single-step undertaking, rather it is a process or workflow incorporating many different activities.

Digitization consists of many activities and aspects that are beyond the scope of this dissertation. Metadata, digitization software, and quality control are some examples of the aspects not addressed in this study. This dissertation's focus is on aspects related to digitization guidelines, compliance with these guidelines, technical specifications, strategies, encountered challenges, and solutions. Different guidelines and technical specifications are adopted to implement digitization in various contexts, such as museums and libraries around the world. There is a need to explore digitization best practices conducted by academic libraries in the United States for both static and non-static (audiovisual) media, in addition to reporting the challenges encountered.

Much of the literature discussed digitization conducted by academic libraries worldwide. Some of those studies focused on a particular theme regarding digitization, such as copyright clearance or staff training. However, it seems as if there is less published information focusing on identifying digitization best practices among academic libraries for both static and non-static (audiovisual) media, as well as reporting on challenges encountered and the recommendation for appropriate solutions. This dissertation attempts to address this research gap through exploring the digitization best practices adopted by academic libraries in the United States. Moreover, it is intended to report the challenges facing digitization efforts and to draw necessary comparisons between digitizing both static and non-static (audiovisual) media. Additionally, it is intended to suggest convenient solutions to overcome the encountered challenges.

This dissertation focuses on the conversion of analog materials; born-digital materials are beyond the scope of this study. Consequently, this dissertation aims to seek answers to five research questions, which are directly related to the area of digitization. The first purpose of this doctoral dissertation is to explore the digitization guidelines adopted by academic libraries in the United States for digitizing static and non-static (audiovisual) media. The second purpose is to investigate compliance levels with adopted digitization guidelines of academic librarians examined in this study, and further investigate whether there are differences in compliance regarding digitization of static and non-static (audiovisual) media.

The third purpose is to report on challenges facing the examined academic libraries during digitization of both static and non-static (audiovisual) media, as well as to draw meaningful comparisons. The fourth purpose is to investigate whether there are any differences in the challenges academic librarians face when digitizing static and non-static (audiovisual) media. The fifth purpose is to discuss applied and suggested solutions to overcome encountered

challenges around/regarding digitization at the examined academic libraries. Accordingly, the five research questions defined for this doctoral dissertation deal directly with digitization with each one of them reporting on a particular theme.

This dissertation has 15 hypotheses which can be either rejected or not after applying the Wilcoxon Signed Ranks Test (nonparametric test) or Paired Samples Test with a significance level at 0.05. The first nine hypotheses (Hypotheses 2.1.A-2.3.C) are related to the second research question. These hypotheses will be applied only for three digitization guidelines (Sections 4.2.1.-4.2.3.), because of their occurrence in both sections (i.e. "Digitization of Static Media" and "Digitization of Non-static (Audiovisual) Media") of the electronic questionnaire. These three digitization guidelines are: 1) ALCTS, 2) consortium/consortia digitization guidelines, and 3) a university's own customized digitization guidelines. Only these three digitization guidelines were selected because ALCTS guidelines discuss both types of media (i.e., static and non-static [audiovisual] media), whereas there is a possibility that these types of media are discussed as well by the other two guidelines. This research question focuses on exploring whether there are differences in the reported compliance with the digitization guidelines by academic libraries in the United States for digitizing static and non-static (audiovisual) media.

On the other hand, the remaining six hypotheses (Hypotheses 4.1-4.6) are related to the fourth research question. Again, these hypotheses can be either rejected or not after conducting the Wilcoxon Signed Ranks Test with a significance level at 0.05. Hypotheses 4.1-4.6 are designed to explore whether there are differences in the challenges academic libraries encounter in digitizing static and non-static (audiovisual) media (Section 4.4). These differences concern the following six aspects: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4)

digitization software, 5) staff digitization skills, and 6) the need for more professional training on digitization. Therefore, these are the research questions and hypotheses:

RQ1. How do academic libraries comply with digitization guidelines and associated reasons?

    A) What are the digitization guidelines and technical specifications adopted by academic libraries for digitizing static and non-static (audiovisual) media?

    B) To what extent do academic libraries comply with digitization guidelines and what are the associated reasons?

    C) To what extent is the availability of the digitization guidelines and what are the associated reasons?

    D) To what extent is the usefulness of the digitization guidelines and what are the associated reasons?

RQ2. Are there differences in relation to academic libraries' reported compliance with the static and non-static (audiovisual) media digitization guidelines?

    H2.1 There is no significant difference reported by academic libraries regarding the level of compliance with the digitization guidelines for static versus non-static (audiovisual) media.

        H2.1.A There is no significant difference reported by academic libraries regarding the level of compliance with ALCTS digitization guidelines for static versus non-static (audiovisual) media.

H2.1.B There is no significant difference reported by academic libraries regarding the level of compliance with the consortium/consortia digitization guidelines for static versus non-static (audiovisual) media.

H2.1.C There is no significant difference reported by academic libraries regarding the level of compliance with the university's own customized digitization guidelines for static versus non-static (audiovisual) media.

H2.2 There is no significant difference reported by academic libraries regarding the level of availability of the digitization guidelines for static versus non-static (audiovisual) media.

H2.2.A There is no significant difference reported by academic libraries regarding the level of availability of ALCTS digitization guidelines for static versus non-static (audiovisual) media.

H2.2.B There is no significant difference reported by academic libraries regarding the level of availability of the consortium/consortia digitization guidelines for static versus non-static (audiovisual) media.

H2.2.C There is no significant difference reported by academic libraries regarding the level of availability of the university's own customized digitization guidelines for static versus non-static (audiovisual) media.

H2.3 There is no significant difference reported by academic libraries regarding the level of usefulness of the digitization guidelines for static versus non-static (audiovisual) media.

H2.3.A There is no significant difference reported by academic libraries regarding the level of usefulness of ALCTS digitization guidelines for static versus non-static (audiovisual) media.

H2.3.B There is no significant difference reported by academic libraries regarding the level of usefulness of the consortium/consortia digitization guidelines for static versus non-static (audiovisual) media.

H2.3.C There is no significant difference reported by academic libraries regarding the level of usefulness of the university's own customized digitization guidelines for static versus non-static (audiovisual) media.

RQ3. What are the challenges that academic libraries face in digitizing static and non-static (audiovisual) media?

RQ4. Are there differences in the challenges that academic libraries face in digitizing static and non-static (audiovisual) media?

H4.1 There is no significant difference reported by academic libraries regarding budget for static versus non-static (audiovisual) media.

H4.2 There is no significant difference reported by academic libraries regarding external funding for static versus non-static (audiovisual) media.

H4.3 There is no significant difference reported by academic libraries regarding digitization equipment/hardware for static versus non-static (audiovisual) media.

H4.4 There is no significant difference reported by academic libraries regarding

digitization software for static versus non-static (audiovisual) media.

H4.5 There is no significant difference reported by academic libraries regarding staff

skills in digitization for static versus non-static (audiovisual) media.

H4.6 There is no significant difference reported by academic libraries regarding the need

for more professional training on digitization skills for static versus non-static

(audiovisual) media.

RQ5. What are the solutions that academic libraries apply or suggest how to overcome these

challenges?

The first research question deals with guidelines and standards recommended by

specialized agencies, initiatives, universities, university archives, or consortia in the United

States regarding the digitization process. Minimum requirements are defined by these institutions

to improve the digitization process of different materials such as: rare books, manuscripts,

photographs, maps, audio recordings, and moving images. Hence, the aim behind this research

question is to identify adopted digitization guidelines and technical specifications by academic

libraries in the United States for digitizing static and non-static (audiovisual) media. Also, levels

of and reasons for compliance, the availability and usefulness of the adopted digitization

guidelines reported by academic libraries are investigated for both static and non-static

(audiovisual) media. Software for digitization is beyond the scope of this doctoral dissertation

because of the variant types of software, such as commercial or open-source software, as well as

constant change and rapid development in software production.

The second research question aims to investigate the level of compliance reported by the examined academic libraries in adopting digitization guidelines for static and non-static (audiovisual) media in greater detail. This research question aims to draw a comparison between compliance levels of adopting digitization guidelines for static media versus compliance levels of adopting digitization guidelines for non-static (audiovisual) media. Additionally, reported levels of availability and usefulness by academic libraries regarding adopted digitization guidelines for static versus non-static (audiovisual) media are investigated.

The third research question aims to explore the challenges US academic libraries face during digitization of static and non-static (audiovisual) media. Further, this research question draws a comparison between the digitization challenges of static and non-static (audiovisual) media. In other words, this question aims to define the challenges facing academic libraries in digitizing static and non-static (audiovisual) media in general. It then compares the reported digitization challenges of static media to those of their non-static (audiovisual) counterparts.

The fourth research question aims to explore whether there are any significant differences in the challenges faced by academic libraries in digitizing static and non-static (audiovisual) media. Differences could be based on many aspects related to the digitization process. However, this research question compares agreement levels given by the subjects for questions 26 and 41 in the electronic questionnaire. Each contains six statements related to different themes around digitization challenges: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4) digitization software, 5) staff digitization skills, and 6) the need for more professional training on digitization.

The fifth question aims to explore appropriate solutions to overcome challenges facing the digitization of static and non-static (audiovisual) media. A fundamental component of this doctoral dissertation involves exploring solutions. Understanding the challenges of digitizing static and non-static (audiovisual) media is not enough to develop a comprehensive base of knowledge regarding digitization within the context of academic libraries in the United States. It is equally important to address practical solutions to overcome the encountered challenges. These solutions could either be applied or suggested by the examined sample of this study.

1.4. Significance of the Study

Digitization is important in our contemporary life for delivering valuable information to future generations. Many scientific domains have discussed this process from particular perspectives such as information studies, computer science, and engineering. However, information studies discuss digitization from different angles, including digitization workflow, staff training, copyrighted materials, and involved computer technologies in the digitization process. Several studies conducted worldwide in different contexts such as museums, archives or libraries have introduced important knowledge to the community regarding digitization (Asogwa, 2011; Bin, 2006; Jones, 2005; Primary Research Group Staff, 2016).

A limited number of research studies discussed the concept of digitization practices in academic libraries (Alhaji, 2007; Pandey & Misra, 2014; Rafiq & Ameen, 2013b). Hence, this doctoral dissertation examines the digitization practices conducted by academic libraries located in the United States, particularly technical specifications and guidelines adopted for digitizing both static and non-static (audiovisual) media. Reported levels of compliance, availability, and

usefulness by academic librarians regarding adopted digitization guidelines for static versus non-static (audiovisual) media are also examined.

Additionally, this dissertation explores the challenges that academic libraries encounter in digitizing static and non-static (audiovisual) media, as well as appropriate solutions. Examining these related themes within this dissertation helps in shaping an overall understanding regarding digitization best practices in the context of academic libraries in the United States. Such an understanding has a two-dimensional significance, which is theoretical and practical in nature. A third dimension is addressed in the dissertation as well, namely a methodological significance.

The theoretical significance of this doctoral dissertation lies in exploring the digitization guidelines and technical specifications for each type of static and non-static (audiovisual) media among different institutions belonging to the same context. Knowing this matter helps in simplifying the establishment of digitization initiatives or even improving current initiatives at similar institutions in the United States or other countries by building a basic and theoretical knowledge regarding best practices. Another theoretical significance concerns exploring widely adopted digitization practices by academic libraries, which helps similar institutions to identify the most widely used practices and guidelines as a starting point for establishing digitization initiatives at their institutions. Moreover, this dissertation aids in evaluating current digitization guidelines and providing suggestions to improve them from an academic librarian's perspective. It is important to understand earlier efforts provided in digitization through examining digitization guidelines and relevant literature. Thus, providing new information and knowledge will help in filling the gap in previous literature, in addition to suggesting solutions to overcome any encountered limitations or challenges.

The practical significance of this study lies in accomplishing digitization projects harmoniously with familiar digitization standards and guidelines that are adopted by other similar institutions. This means that if a particular academic library is conducting digitization activities in the same way as other academic libraries, it helps in establishing future cooperation such as access sharing between digital collections. Such understanding of familiar digitization guidelines and best practices will help in improving several areas linked to digitization practices. For instance, improving staff digitization skills through conducting workshops and seminars positively affects digitization projects.

Also, exploring digitization strategies and processes will assist in applying such projects more efficiently. This doctoral dissertation aims to provide help in selecting wisely regarding different areas such as digitization strategies, technical specifications, and compliance with digitization guidelines. Moreover, reporting on digitization challenges offers examples to some libraries, optimizing their chances of handling such situations successfully. Similarly, shedding light on these challenges may help professionals in the area of digitization to closely examine these challenges and suggest effective solutions.

The potential methodological significance of this study becomes clear within this doctoral dissertation. There are two sequential phases for this study, which are quantitative and qualitative. Both are related and support each other for data collection and analysis. Gathering the required data for answering the five research questions was achieved through applying quantitative and qualitative data collection techniques. The adopted qualitative data collection techniques helped in collecting the missing data, gathered in the first phase by the quantitative data collection technique. Hence, more in-depth data were collected through both data collection techniques, which facilitated more detailed and accurate results. In other words, the adopted

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research methodology for this doctoral dissertation helped in providing a rich quantity of data that were also thorough and in-depth.

This doctoral dissertation is following a mixed methods research design, particularly the explanatory design. Purposive sampling was adopted to collect data for the quantitative and qualitative phases of the study. Data collection techniques consisted of document analysis, an electronic questionnaire, and semi-structured interviews. Qualitative and quantitative data were analyzed through applying different data analysis techniques, specifically: open coding, descriptive statistics, and statistical analysis for comparison (i.e., Paired Samples Test and Wilcoxon Signed Ranks Test [two-tailed]). Further details about the design of this doctoral dissertation are discussed in section *Research Design* (Section 3.1.).

1.5. Chapter Summary

Valuable information resources need to be accessed and stored beyond geographical and temporal boundaries. It is clear that digitization is important in our contemporary era. This chapter discussed the scope of this doctoral dissertation within the area of digitization. Five research questions were addressed concerning digitization. The themes of these research questions dealt with digitization guidelines, compliance levels, encountered challenges, and both applied and suggested solutions. Exploring these themes is a main aim of this doctoral dissertation.

Chapter 2 Literature Review

The rise of the internet is considered an important development that facilitated more usage to the electronic network between computers (Lesk, 2005). The online information industry took the form of online hosting services during early 1990s, enabling information retrieval by subscribers through special terminals, then their personal computers (Calhoun, 2014). Enhancing the quality of computer displays and the software used for handling information led to encouraging more people to read directly from computer screens (Arms, 2000). Furthermore, digital finding aids and surrogates were new methods offered by electronic technology to provide researchers with more access to the collections (Smith, 1999a). All these changes and shifts in technology development affected many sectors dealing with information resources, particularly libraries.

Contemporary libraries are distinguished for their numerous collections, which differ based on their types and formats. Analog and digital items are hosted by these libraries; this addition adds richness to their collections and resources. Arms (2012) stated that "libraries have succeeded in embracing much of the potential of online information, often in ways that were not predicted" (p. 589). Libraries are shifting from print to digital collections during the current transition period (Moghaddam, 2010). A decline in the importance of printed materials has occurred as a result of increased reliance on digital collections (Falk, 2003). This shows the increasing importance of information in digital form.

Libraries today are shaped by new technological advances, and the way people interact with libraries was shifted as a result of the new electronic resources and virtual access to information (Purcell, 2016). Most information is born digital and disseminated only electronically nowadays (Gladney, 2006). There are many examples of digital materials such as

databases, texts, audio, still and moving images, web pages, and software, which exist in numerous formats (Moghaddam, 2010). Indeed, the digital world is represented by binary strings consisting of 0s and 1s, offering the opportunity for data creation, manipulation, and sharing (Kannappanavar, Rajanikanta, & Tandur, 2010). Hence, the way of learning, communicating, and thinking is transformed as a result of the digital information (Kannappanavar et al., 2010). This shows that individuals' information needs will be affected by the new changes. Hence, libraries need to accommodate their services based on technological developments regarding accessing and preserving information.

Indeed, the growing demand for quick and easy access to updated information content came as a result of the expansion of computer networks and the availability of high-speed access to the internet (Hughes, 2004). Network accessibility, ease of search, convenience of use, along with overall satisfaction and digital information's accessibility were among the factors motivating users to use digital resources instead of materials available in traditional form (Paul & Singh, 2014). Also, flexibility is one of the advantages of digital information that facilitates editing and reformatting digital texts, which are neither finite nor final, unlike printed texts on paper (Smith, 1999b).

Unfettered access, better analysis and manipulation capabilities, along with flexibility, represent examples of the potential benefits of digital information (Kannappanavar et al., 2010). Digital products facilitated faster searching and less storage area (Bansal, Kumari, Kumar, & Singh, 2005). Arms (2000) discussed the many benefits of digital libraries such as: 1) bringing the library to the user, 2) searching and browsing by using computers, 3) sharing information, and 4) updating information easily. Also, Calhoun (2014) mentioned many key outcomes emerging as a result of the first decade (i.e., 1991-2001) of digital library research and practice

such as: 1) technological innovations, 2) digitization and digital preservation, and 3) metadata and standards. For instance, there are many digitization advantages such as: full-text searching, a user interface with a new design, cross-collection indexing, besides digital data that are easy to reformat, edit, or print (Kannappanavar et al., 2010).

Accordingly, new activities and responsibilities related to digitization are assigned to librarians as a result of the nature of the newly hosted collections. The amount of digital information has rapidly increased, because of digitizing analog items and the proliferation of digital publication (Digital Preservation Coalition, 2008). "Digitization is a complex process, and there are concrete benefits to be realized from many types of digitization projects" (Hughes, 2004, p. 9). Kannappanavar et al. (2010) explained the importance of digitization as a result of two reasons: the availability of electronic information for a wider audience, and more concepts related to digitization other than hardware and software such as: access systems, project planning, and preservation of digital assets.

The literature review in this chapter covers many aspects related to the scope of this doctoral dissertation. This literature review contains the following sections: 1) *Digitization: Research and Practice* (Section 2.1.), 2) *Significance of digitization* (Section 2.1.1.), 3) *Digitization strategies* (Section 2.1.2.), 4) *Digitization process* (Section 2.1.3.), 5) *Digitization guidelines* (Section 2.1.4.), 6) *Components of digitization guidelines* (Section 2.1.5.), 7) *Digitization of static media compliance* (Section 2.1.6.), 8) *Digitization of non-static (audiovisual) media compliance* (Section 2.1.7.), and 9) *Digitization: challenges and suggested solutions* (Section 2.1.8.) and its sub-sections (Sections 2.1.8.1.-2.1.8.4.).

2.1. Digitization: Research and Practice

Technology facilitates the storage and transmission of digital information, which leads to expanding the ease of access to source materials and bibliographic records within the context of research libraries (Smith, 1999a). A worldwide movement from analog systems to digital ones represents a paradigm shift (Rafiq & Ameen, 2013b). Indeed, "Digital files can provide extraordinary access to information" (Smith, 1999b, p. 7). High costs for preserving tangible materials, establishing remote access, decreasing budgets to acquire new stocks for the library, and the increase of electronic information are reasons to encourage digitization (Pandey & Misra, 2014). Smith (2001) indicated that preserving analog collections and extending their reach represents two reasons identified by libraries for digitization. Other reasons for digitizing library materials are: making public records more accessible, providing new ways of accessing materials, preserving old materials, providing enhanced facilities for searching and retrieval, besides, it is an opportunity to develop the staff skills and the technical infrastructure (Pandey & Misra, 2014).

Since digitization deals with different materials within the library context, it is essential to pay attention to types of materials and their variant natures. The first type of digital material is converted into digital form from an analog one, while the second type is originally produced in a digital format, such as digital photographs and electronic books (Pandey & Misra, 2014). This doctoral dissertation is restricted its focus to the digitization of analog materials only, including both static and non-static (audiovisual) media. A variety of formats and mediums can be digitized: images, maps, manuscripts, and sound recordings (Abd Manaf & Ismail, 2010).

Nonetheless, libraries and museums host a huge variety of information resources. For some digitization projects, a careful selection of these materials may help in enhancing the overall success of the digitization project itself. Academic importance, increasing access to documents, and preventing originals from damage represented the major three criteria in selecting library materials for digitization (Rafiq & Ameen, 2013b). Similarly, Vrana (2010) found that user interest was the most important selection criteria for digitizing library materials, while an item's age came second, followed by its cultural value.

Regarding type of materials, Paul and Singh (2014) found that institutional publications received the first priority for digitizing materials, while journals were ranked second, and personal collections third. Theses and dissertations, rare books, as well as journals and other serials received the highest priority in digitization as mentioned by Rafiq and Ameen (2013b). Also, The Institute of Museum and Library Services (2006) investigated the mostly digitized items by academic libraries, and it was found that photographs were digitized by 8.3% of the examined academic libraries, 13.1% of them digitized course materials, and 8.2% of them digitized institution's information.

Moreover, there is more than a single way for digitizing these variant materials. The terms in-house and outsourcing refer to the physical location of the digitization process, as well as personnel involved in this process (Lee, 2001). In-house digitization means that the material is captured locally at the institution and the institution is responsible for providing the appropriate hardware, software, overheads, and trained personnel even if the location of the digitization process is different from the location used to hold the collection (Lee, 2001). Hence, regarding digitization of special and rare collections, in-house digitization is often used for these

collections in order to ensure a safe environment (Rieger, 2010). Consequently, the scope of this doctoral dissertation encompasses only in-house digitization best practices.

2.1.1. Significance of digitization

"Preservation and access go hand-in-hand" (Zorich, 2007, p. 458). Many researchers in their studies discussed the significance of digitization for access and preservation (Falk, 2003; Liu, 2004; Pandey & Misra, 2014; Paul & Singh, 2014; Xie & Matusiak, 2016). Many institutions are spending large amounts of money on digital conversion projects in order to provide increased access to their collections, as well as preserving these collections (Smith, 1999b). There are two aims of digitizing materials at the library, preserving and providing access for library patrons (Pandey & Misra, 2014). For instance, digitization is one of the strategies for preserving newspapers at university libraries located in Nigeria, as well as increasing access to these newspapers (Ugah, 2009). Hence, supporting access and maintaining long-term preservation for audiovisual materials through the digitization approach is commonly accepted practice (Xie & Matusiak, 2016).

The advantages of digitization make it acceptable to many institutions focusing on access and preservation. Digital image collections play a role in increasing awareness and providing access to analog collections, which "thus serve both an educational and a promotional function" (Besser, 2003, p. 31). Using digital surrogates supports the conservation of original artifacts through reducing the tear in these original artifacts, but these digital surrogates may lead to increasing handling of the original artifacts as a result of the increased awareness (Besser, 2003).

In the future, the digital version may be the only available record of a deteriorated or destroyed original object (Gertz, n.d.).

Most digital projects in the United States aim to provide wider access to collections of historical resources for the purpose of contributing to research, education, and awareness (Liu, 2004). Rare materials become accessible through digitizing them, although the electronic versions do not substitute for the originals (Potter & Holley, 2010). Allowing electronic access to ancient documents through converting them became a necessity for many reasons, such as reducing the number of paper documents, and enhancing access to these documents (Charfi, Boussellaa, & Alimi, 2007).

Access and preservation goals are interrelated, because keeping scholarly materials usable over time facilitates accessing these materials (Rieger, 2010). Access and preservation are the two goals of digitization that one completes the other by indicating that surrogate copies of both rare and fragile items are created by digitization to support preservation practices (Xie & Matusiak, 2016). Using computers in indexing and digitization is incorporated with other techniques such as allowing virtual scrolling as a way of preserving the original documents, using keywords in indexing as a way of enhancing searching the document, defining rare materials by having them in compact optical media, and enabling both remote and simultaneous access for most demanded materials (Charfi et al., 2007). Similarly, keyword searching and attaining high quality reproductions of original materials through optical character recognition (OCR) as a result of digitization greatly affects rare materials (Potter & Holley, 2010).

Digitization is crucial for access. Beagrie and Jones (2008) defined access as "continued, ongoing usability of a digital resource, retaining all qualities of authenticity, accuracy and

functionality deemed to be essential for the purposes the digital material was created and/or acquired for" (p. 24). Digitization provided new opportunities for special collections through open access by making the content of primary sources available online for users worldwide (Daigle, 2012). Preserving original texts, as well as providing access for both researchers and scholars is accomplished through digitizing manuscripts (Sahoo & Mohanty, 2015). Hence, access can be increased as a result of making materials available online, while instances of handling original materials will be reduced (Caro, 2016). For instance, Caro (2016) mentioned that creating digital surrogates at the Billings Public Library led to preservation of the original images in addition to improving online access.

The objective of increasing accessibility was the most preferred objective of digitization from librarians' perspectives, while preservation objectives ranked second (Paul & Singh, 2014). Keneley et al. (2016) observed that planning and risk management represent an essential part of the digitization process, meaning that digitization is viewed as a primary part of the record preservation process. Although recognized as an access tool, considering digitization as a preservation method is not yet accepted (Capell, 2010). Indeed, considering digitization as a strategy for preservation is an ongoing debate (Matusiak & Johnston, 2014). There was an acceptance of digitization as a way of copying to facilitate a wider access, however, looking at it as a way of producing "preservation-quality copies" has not yet been accepted (Matusiak & Johnston, 2014, p. 248). The digital copy created by the institution means this new resource will require preservation, raising many concerns regarding assuring digital resources' accuracy, authenticity and continued existence (Gertz, n.d.).

There are many reasons for digitizing materials: enhanced access, and reducing handling of fragile materials (Fatoki, 2007). The only method for providing access to objects that cannot

be physically handled is through digitization (Zorich, 2007). "For materials that cannot withstand frequent handling or, because of their value or content, pose security risks, digitization has proved to be a boon" (Smith, 2001, p. 7). Also, preserving fragile materials by providing an alternative accessible resource is considered as an option fulfilled through digitization (Keneley et al., 2016). Lampert and Vaughan (2009) mentioned that the goals of digitization include enhancing access to digital collections along with building access to collections of different formats for supporting research and teaching efforts at the University of Nevada at Las Vegas (UNLV). Both factors, of having unique items within the collection and increasing access to fragile items reflecting a preservation concern, were the most two important factors for establishing or enhancing digitization projects (Lampert & Vaughan, 2009).

Storage and distribution of digital files created through digitizing the originals represent the main factors for digitization (Wentzel, 2006). Accessing digitally formatted information is cheaper as compared to accessing the print versions (Alhaji, 2007). Digitization helps in providing electronic access to a library's collections, preserving items and also protecting them from being stolen as a result of the absence of electronic security systems in developing countries (Jagboro, Omotayo, & Aboyade, 2012). Reasons for digitizing analog collections include: building qualified staff with essential skills, enhancing access to rare and fragile items, and influence the building of digital projects due to the experimental nature of many of them (Ma & Semali, 2003).

Providing online access to digitized materials for both local and international users is the reason for libraries' involvements in digitization projects around the world (Rafiq & Ameen, 2013a). Digitization is adopted to create digital collections from the information resources in print format at university libraries in order to facilitate remote access (Rafiq & Ameen, 2013b).

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Another recent case of the digitization experience is discussed by Chmielewska and Wróbel (2013), who described the digitization process that took place at University of Warsaw Library in order to provide access to the historical documents.

There are many reasons for encouraging cultural institutions all over the world to be involved in digital projects: promoting the institution and its collections, reducing the handling of heavily used items, and providing access (Asogwa, 2011). Continuous commitment from the institution to migrate both image and index data to a newer technology is essential for ensuring long-term access (Conway, 1994). Improving access to digital resources is the main purpose of the digitization, and creating digital surrogates of fragile and rare items through digitization is beneficial in reducing damage caused by physical handling (Gbaje & Bot, 2009). Academic libraries, in most cases, do not exchange rare materials through interlibrary loan since borrowing the digital version or digitizing a requested material for a fee is a viable option which fulfills the needs of the most research (Potter & Holley, 2010).

Digitization is also used for preservation purposes. Digitization is one among several promising long-term preservation strategies (Capell, 2010). Lynch and Brownrigg (1986) mentioned many features of digital images regarding the use of digitization for preservation and conservation. For example, digital images cannot be deteriorated through use, they are less affected by environmental disasters, and they can be delivered through a high speed connection (Lynch & Brownrigg, 1986). Preserving the original, as well as increasing either access, or sale are the main reasons that spur libraries, publishers, and museums to get involved in digitization projects (Lee, 2001).

Both preservation purposes and providing wider access lies behind digitizing rare and special collections (Falk, 2003). Preservation was the main purpose for developing digital collections at 53.33% of the surveyed public libraries in Croatia, while increasing access to digital materials was the main reason for 40% of them (Vrana, 2010). Making cultural heritage materials in physical and digital formats accessible for teaching, research or personal enjoyment is the reason for preserving these materials (Zorich, 2007). Hence, it is essential to take preservation issues into consideration when digitizing cultural heritage collections (Xie & Matusiak, 2016).

2.1.2. Digitization strategies

There are no strategies guarantee success in ensuring consistent quality in collections digitization, because of the uniqueness of each project (Chapman, 2004). Nevertheless, a few studies discussed two common strategies of implementing digitization even though terminology differences may occur in naming them. For instance, both Coyle (2006) and Dahlström (2010) discussed two different digitization strategies. Coyle (2006) reported mass and non-mass digitization, whereas Dahlström (2010) indicated that the digitization strategies are both mass and critical digitization. Researchers explained the significant differences between these different digitization strategies, which affect the digitization workflow and the final products.

For example, mass digitization (e.g., Europeana and Google Book Search) focuses on scale in order to digitize large collections on a systematic basis, whereas critical digitization focuses on a limited number of documents to manually and critically produce a digital object enriched with large amounts of metadata (Dahlström, 2010). Therefore, Dahlström, Hansson and

Kjellman (2012) indicated that libraries prefer the ideals of mass digitization strategy since it is simple and linear, whereas critical digitization is threatened by avoidance for its high costs. In other words, mass digitization adopts the quantitative design since it focuses on massive amounts of documents, whereas critical digitization adopts the qualitative one since it focuses on unique documents (Dahlström, 2010).

It is worth mentioning that non-mass digitization emerged as a result of preservation projects which either provide access to rare materials or create copies of those that may be deteriorating (Coyle, 2006). In contrast, mass digitization aims to convert the entire libraries' materials without a selection strategy, whereas non-mass digitization conducts a careful selection of materials (Coyle, 2006). Nonetheless, mass digitization has many issues such as developing a user interface for the materials which were digitized (Coyle, 2006). Additionally, mass digitization uses industry standards like TIFF, while there is a lack of common standards for the overall package that includes images (Coyle, 2006). As a result, it became obvious that determining the most appropriate digitization strategy between the two depends on the library's goals and objectives for conducting the digitization project.

2.1.3. Digitization process

A goal, rather than a technology, must shape digitization projects (Kannappanavar et al., 2010). Indeed, digitization projects require adequate preparation. Having a clear and coherent digitization policy can be a major factor in implementing a successful digitization project. The topic of digitization policy was discussed by many researchers in their studies (Alhaji, 2007; Iwhiwhu & Eyekpegha, 2009; Pandey & Misra, 2014; Rafiq & Ameen, 2013b). Ebdon, Gould, &

Varlamoff (1999) mentioned that the IFLA/UNESCO survey revealed that only 48% of the examined libraries and archives have a program to digitize collections. Also, The Institute of Museum and Library Services (2006) mentioned that 30.6% of all digitization policies at academic libraries were related to access, 23% to digital format, and 19.7% to issues of intellectual property.

Digitization is associated with many activities and responsibilities that are essential for success (Walsh, 2013). Planning, designing, implementation, and evaluation represent requirements for any digitization project (Bansal et al., 2005). Huge amounts of strategic planning before successfully digitizing any item is a requirement for digitization initiatives (Mallan & Park, 2006). Planning digitization projects includes defining guidelines and standards for image quality, as well as metadata standards (Fatoki, 2007). Both organizational affiliation and a commitment at the institutional level for long term maintenance and preservation of digital assets are required to have digitization programs that are sustainable in nature (Xie & Matusiak, 2016).

Many researchers discussed digitization workflow and its variant stages (Pandey & Misra, 2014; Wentzel, 2006; Xie & Matusiak, 2016). Purcell (2016) clarified five stages of digitization: the concept stage such as defining the project's vision and mission, creating a team by defining the required people and equipment, decision-making as demonstrated by determining the technical and content decisions, the implementation stage such as selecting and creating digital content as well as purchasing equipment, and finally the stage of sustaining efforts by preserving, migrating, and securely storing created digital content in a virtual environment which is stable in its nature.

The six basic steps for the digitization process mentioned by Xie and Matusiak (2016) are: 1) planning, selecting and preparing materials, 2) image capture, 3) digital processing, 4) creating metadata, 5) ingesting, and 6) digital preservation. Zuo (2013) said regarding the workflow of digitization at archives that "Archives digitization of the basic aspects include: Sorting archives, Building a database, Archives scanning, Image processing, Image storage, Data quality, Data articulated, Data inspection, Data backup, Results-based management and so on" (p. 4278).

2.1.4. Digitization guidelines

Creating high-quality and sustainable digital objects supporting interoperability and consistency across collections and institutions is the purpose of digitization guidelines (Xie & Matusiak, 2016). Digitizing at the highest resolution suitable for each material, and digitizing at a high level of quality to avoid rehandling the materials are examples of general digitization principles identified by Xie and Matusiak (2016) in some of the current guides. Many digitization standards and guidelines regarding technical specifications were developed and suggested by specialized institutions and initiatives.

There are many digitization guidelines available on the internet, which differ in many aspects. Conway (2008) said regarding the implication of the lack of digitization quality standards: "continuing investment in small scale experimental projects by small and mid-size organizations that either are unaware of or do not necessarily trust the recommendations of existing best practices guidelines" (p. 100). However, knowledge and awareness of the most recent best practices, metadata schemata, and hardware and software components is essential for

leaders of such digital initiatives (Purcell, 2016). Determining the minimum dpi, file formats, compression, and bit-depths for both master files copies, and the gallery of the digital library are defined by the library initiatives (Liu, 2004).

Recommended resolution, file formats, and color bit depths for listed variant types of items would be included in a digitization standard; other standards may discuss adjusting scanners and setting up the room for scanning (Perrin, 2016). Hence, digitization must comply with set standards, but finding the proper standard or any existed one is a challenge (Walsh, 2013). Besides, users' different needs affect defining aspects such as sizes, formats, and degrees of optimization (Walsh, 2013).

Different digitization guidelines were developed by organizations, universities, archives, and other institutions in the United States to suggest recommended technical specifications. Some of these were developed to serve particular contexts like archives, digital libraries, libraries or consortia. For instance, the Consortium of Academic and Research Libraries in Illinois (CARLI) created its own documents regarding digitization best practices for different materials. Also, the U.S. National Archives and Records Administration (NARA) published its own document of technical guidelines regarding digitizing archival materials.

An examination of digitization guidelines available on the internet in order to conduct a document analysis revealed significant differences among the examined digitization guidelines. First, there was variation in the used expressions to name the titles of these documents. For instance, the term digitization was used in some documents, whereas others referred to digitization as digital imaging or digitization capture. Similarly, some documents used the term

guidelines in their titles, whereas others used recommendations, or best practices. Thus, it became obvious that there is an absence of agreement on choosing terms.

Furthermore, the structure and contents of the examined digitization guidelines varied among these documents. It was noted that several digitization guidelines included some other activities that take place either before or after the digitization action itself. For instance, some digitization guidelines provided explanation about different concepts such as quality control, file naming, handling metadata, digital preservation, storage, used software and hardware, digitization equipment, and technical specifications. Others discussed fewer concepts. Further, the level of detail varied among the documents examined for this dissertation. Some digitization guidelines were brief in their provided information; other guidelines provided more detailed explanations such as explaining main concepts or terminology and providing external links.

Also, examining digitization guidelines during the document analysis step for this doctoral dissertation revealed various differences among these guidelines or best practices, although some similarities were found. It was noticed that there is no particular design or structure for creating digitization guidelines that all institutions are following. The variation found among the examined digitization guidelines might provide choices for institutions working to create their own guidelines, but it might just as easily create a challenge. Therefore, it is important that a digitization guideline be extremely informative in a reasonable way that reduces possible confusion or ambiguity from the reader's side.

Regarding national and regional digitization guidelines examined for this dissertation, there are two national digitization guidelines and other two regional ones. These national guidelines are: 1) Association for Library Collections and Technical Services (ALCTS), 2)

Federal Agencies Digitization Guidelines Initiative (FADGI), and 3) National Archives and

Records Administration (NARA). The sources of these regional guidelines are: 1) BCR's CDP

Digital Imaging Best Practices Working Group, and 2) Consortium of Academic and Research

Libraries in Illinois (CARLI). After conducting document analysis for this doctoral dissertation,

it was noticed that these four digitization guidelines are thorough in their explanations and all

discussed various topics. Examples of these topics were metadata, file naming, quality control,

and hardware.

The Association for Library Collections and Technical Services (ALCTS), a division of

the American Library Association issued the *Minimum Digitization Capture Recommendations*

in 2013, submitted by (Bogus et al., 2013) to discuss the digitization of both static and time-

based media. The authors reviewed previous research, the practices of nearly 50 organizations,

FADGI guidelines, other guidelines, and a sample of digitized works to recommend the

minimum acceptable specifications (Bogus et al., 2013). Regarding FADGI guidelines, FADGI

(2016) mentioned that these guidelines represent the participating agencies in FADGI Still Image

Working Group, as well as the shared best practices. These digitization guidelines focus on

cultural, archival, and historical materials such as still images, maps, and manuscripts, whereas

moving image and audio/visual materials are not discussed (FADGI, 2016). Puglia, Reed, &

Rhodes (2004) mentioned that The *NARA Technical Guidelines for Digitizing Archival Materials*

for Electronic Access: Creation of Production Master Files – Raster Images is a revision of the

NARA Guidelines for Digitizing Archival Materials for Electronic Access published in 1998.

Digital image capture and file formats are examples of the topics discussed in these guidelines

for digitizing specific types of materials such as graphic illustrations, maps, and photographs

(Puglia et al., 2004).

BCR's CDP Digital Imaging Best Practices Working Group (2008) introduced the second version of the *BCR'S CDP Digital Imaging Best Practices*, whereas it was originally published in 2003 as the Western States Digital Imaging Best Practices by the Colorado Digitization Program. This version of guidelines included sections related to image quality, storage and preservation, digital photography, and selecting equipment (BCR's CDP Digital Imaging Best Practices Working Group, 2008). However, CARLI was formed by the merger of three Illinois academic library consortia (Illinois Cooperative Collection Management Program, Illinois Digital Academic Library, and Illinois Library Computer Systems Organization), and started its operations in 2005 (History & Governance | CARLI, 2017). The website of CARLI (URL: https://www.carli.illinois.edu/products-services/contentdm/cdm-documentation) has several documents to describe best practices for different digital collections: images, text, audio, moving images, and three-dimensional objects.

The fourth chapter of this doctoral dissertation has a document analysis of these national and regional digitization guidelines (Sections 4.1.1.1. and 4.1.1.2.). The two specialized sections in the fourth chapter provide an analysis of digitization guidelines for both static and non-static (audiovisual) media. Five digitization guidelines were examined, whereas one of them (i.e., CARLI) has five documents. Three digitization guidelines focused on static media only (i.e., BCR's CDP Digital Imaging Best Practices Working Group, FADGI, and NARA), whereas both static and non-static (audiovisual) media were discussed by two guidelines (i.e., ALCTS, and CARLI). During the document analysis process conducted for this study, technical specifications for digitization were gathered from different resources for a better explanation and understanding. The examined digitization standards and minimum requirements are suggested by specialized agencies to handle the digitization process of both static and non-static (audiovisual)

media. The fourth chapter of this doctoral dissertation has more details regarding digitization standards and technical specifications.

2.1.5.   Components of digitization guidelines

Guidelines and standards regarding digitization activities vary among different projects, while different types of libraries used their own digitization policies (Liu, 2004). The availability of multiple best practices as a result of the diversity of the ideas and the selected materials for digitization represent an obstacle (Hurst-Wahl, 2009). "In most cases, organizations have not made their practices publicly available. We feel that best practices simply have not emerged yet in most areas of electronic records and digital asset management" (Nelson, 2009, p. 2). However, documents for explaining digitization best practices may differ in their designs and contents. There are many sections of these documents, which explain the components of digitization best practices. Hurst-Wahl (2009) indicated that best practices are not limited to the conversion process, but that it deals with many aspects such as metadata, selection process, and outsourcing.

Regarding library digitization, Sotošek (2011) described different best practice examples dealing with many aspects: 1) image capture standards, 2) digital capture equipment, 3) handling the materials, 4) generating metadata, 5) Optical Character Recognition, 6) accessing the digital content, 7) workflow management, 8) quality assurance, and 9) digital preservation's cost modelling. Likewise, Nelson (2009) the chair of the *SAA Technology Best Practices Task Force* introduced an online report on identifying best practices for various materials such as digital images and texts. The report provided by Nelson (2009) presented selected bibliography of best practices gathered from various resources on handling different aspects such as: building digital

collections, metadata, digital audio, and technical standards defined for the digital conversion. Similarly, the content of the document provided by ETH-Bibliothek (2016) described six main sections for digitization best practices, which deal with: 1) planning, 2) preparation of the material, 3) digitization process, 4) storage and archiving, 5) metadata and recording instruments, and 6) sources. Under these six main sections provided by ETH-Bibliothek (2016), many subsections were nested which deal with different aspects such as: 1) digitization parameters, 2) file names, 3) file formats, master and usage formats, 4) scanners, and 5) quality control and image processing.

As seen in the previous paragraphs, best practices may deal with many areas, including metadata, selection, and quality control. However, these areas are beyond the scope of this doctoral dissertation, whereas digitization technical specifications and standards represent one of the main themes of this study. For the purpose of this study, six documents containing digitization guidelines analyzed during the document analysis stage contained the term best practices in their titles. These digitization guidelines were issued by BCR's CDP Digital Imaging Best Practices Working Group, and the Consortium of Academic and Research Libraries in Illinois. The document analysis technique conducted on these documents within this doctoral dissertation examined the adopted technical specifications for digitizing various materials.

The following two sections (Sections 2.1.6. and 2.1.7.) deal with digitization compliance for both static and non-static (audiovisual) media, respectively. These two sections present information regarding digitization of various types of static and non-static (audiovisual) media. Many digitization aspects are discussed: different types of these media, statistics about digitizing these media, technical factors/specifications, and file formats. In other words, these two sections

provide an introduction to basic knowledge within the area of digitizing static and non-static (audiovisual) media.

2.1.6. Digitization of static media compliance

Materials prepared for the digitization process differ in their nature. Archival records, rare books, newspapers, photographs, manuscripts, and postcards represent the majority of static media converted, either through digital photography or scanning by digital cameras or scanners (Xie & Matusiak, 2016). Static media are considered as vital materials for digitization projects in many institutions. However, storing texts is described by Leggett (2014) as a complicated process for archives, because of the two different types of text. Text could either be born a digital text file, or originally in a physical format, whereas the second type should be treated as an image although it appears as text from users' points of view (Leggett, 2014). This shows that adopting digitization technical specifications is not enough to ensure a successful digitization project. Instead, a comprehensive understanding is required by the personnel involved in digitization regarding all factors involved that may affect the digitization process.

There are many recent statistics regarding digitizing static media. These demonstrate the actual status of digitization in particular contexts. For instance, the Primary Research Group Staff (2016) surveyed the digitization projects at 61 participating libraries and museums. Primary Research Group Staff (2016) mentioned that 41.46% of the surveyed libraries and museums located in the United States considered digitization of photographs as the most critical factor/medium for them. In comparison, the same study showed that 24.39% of the investigated museums and libraries located in the United States considered digitizing text as the most critical

factor/medium. These statistics provided by Primary Research Group Staff's (2016) study confirm the importance of converting static media by those libraries and museums, particularly photographs.

There are many considerations regarding the digitizing of static media. Resolution, pixel bit depth, color mode, modes of capture, compression, and formats represent technical factors of digitizing static images (Xie & Matusiak, 2016). Resolution, color mode, and file format represent the three factors affecting the digitized document's quality and file size (Zhou, 2010). Recently, Xie and Matusiak (2016) mentioned that the quality of digital master files is directly affected by image measures such as resolution, color mode, and bit depth. *Resolution* was explained by Mani (2009) as "The number of dots, or pixels (picture element), used to represent an image" (p. 70). Puglia (2000) explained that resolution can be described in several ways, which are: 1) dots per inch (DPI), 2) pixels per inch (PPI), and 3) lines per inch (LPI) used for halftones. One source defined *bit depth* as "The number of bits allocated to an individual pixel in a digital image" (Monson, 2017, p. 171). Furthermore, Xie and Matusiak (2016) mentioned three types of *color modes* which are: 1) *bitonal* to be used for text materials without illustrations, 2) *grayscale* to scan items like black and white film negatives or photographic prints, and 3) *RGB* color mode to be used for colored visual and textual items. However, it is worth mentioning that resolution refers to pixels per inch (ppi) or dots per inch (dpi), whereas pixel bit depth ranges from 1-24 bits per pixel (Mani, 2009). Recently, Bogus et al. (2013) mentioned different values for the bit depth, which can be represented by the multiples of 8 like 1, 8, 16, 24, and 48, besides they explained that the higher numbers contain more colors.

Defining file formats, minimum digitization requirements, and suggested hardware are included and described as part of many digitization guidelines. Regarding file formats, it is

recommended that images be stored in different file formats by having a specific format for archiving purposes and another for internet access (Leggett, 2014). Monson (2017) mentioned TIFF, JPEG, JPEG 2000, PNG, PDF, and PDF/ARCHIVAL as examples of image file formats. TIFF format is best for archiving, as it stores a lot of information with lossless compression, while other smaller formats, such as JPEG and PNG are recommended for internet access (Leggett, 2014). PDF is used in digitization as a derivative format, while PDF/A is used to ensure preservation of an electronic document (Xie & Matusiak, 2016). Regarding JPEG 2000, Fleischhauer (2014) mentioned that this file format was used by the library for derivative files to provide online access for files with large content such as scanned newspaper pages and maps, because of its ability to scaling and zooming.

Master files are saved as TIFF files that are uncompressed, whereas JPEG file format is used for derivative files of photographs (Monson, 2017). Encryption, watermarks, or other access inhibitors should not be included in master files, additionally these files should not be compressed, either by lossy or proprietary compression (NISO Framework Working Group, 2007). Zhou (2010) indicated that uncompressed images in TIFF format represent master files, whereas compressed files represent access files. From a practical perspective, Yu (2014) indicated TIFF file format was used for preservation purposes during digitizing selected items of rare Chinese books, whereas JPEG file format was used to create internet access files. Also, TIFF file format was selected for archiving scanned images in digitizing scientific articles (Anderson, 2001).

This variation of file formats makes particular formats more eligible for digitization and digital preservation, while others might not satisfy the needs of digitization or digital preservation projects. Nonetheless, an overall understanding will be developed through

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examining official digitization guidelines later in this doctoral dissertation. The fourth chapter of this study (Section 4.1.1.1.) includes an analysis of technical specifications that were mentioned by the analyzed digitization guidelines for different types of static media.

Best practices take into consideration the digitization process as well. FADGI (2016) explained the digitization workflow plan for both large and small projects, in addition to introducing two workflow examples for large projects. In general, FADGI (2016) mentioned that the workflow plan considers certain steps, which are: 1) selecting materials, 2) condition evaluation, 3) cataloging, 4) creating metadata, 5) production scheduling, 6) digitization prep, 7) digitization, 8) post processing, 9) reviewing the quality, 10) archiving, and finally 11) publishing. However, the literature introduced many examples for the digitization process as well in order to clarify the stages and steps of digitization (Anderson, 2001; Xie & Matusiak, 2016).

2.1.7. Digitization of non-static (audiovisual) media compliance

Ebdon et al. (1999) mentioned that the IFLA/UNESCO survey revealed that 50% of the examined libraries and archives digitize sound recordings, whereas only 25% of these institutions digitize film or video. Audio and moving images are in smaller quantities as compared to photographic and textual items hosted by digital libraries, although they are increasing in their numbers (Xie & Matusiak, 2016). Libraries preserve and provide access to moving images such as films and video recordings (CARLI, 2017c). There are many examples for audiovisual resources: music, oral history, poetry readings, lectures, speeches, and broadcast programming, while the majority of these recordings are in analog format and face deterioration (Xie & Matusiak, 2016).

Primary Research Group Staff (2016) reported that only 4.88% of the surveyed museums

and libraries located in United States considered digitizing voice recordings or music items as the

most critical factor/medium. Regarding digitizing films or videos by the surveyed museums and

libraries located in United States, only 2.44% of them considered digitizing films or videos as the

most critical factor/medium (Primary Research Group Staff, 2016). However, none of the

surveyed college and university libraries considered digitizing films or videos as the most critical

factor/medium (Primary Research Group Staff, 2016). Comparing these statistics to those

mentioned by Primary Research Group Staff (2016) in the previous section reveals a point of

view. It is assumed that digitizing photographs and texts is preferred by many libraries and

museums in the United States as compared to digitizing voice recordings and videos. This might

be a result of their smaller quantities in comparison to photographs and texts, as indicated by Xie

and Matusiak (2016) earlier. However, closely exploring the reasons for this preference will help

in initiating a better understanding of these statistics. Such an understanding may help in

improving digitization of audio and video materials in the future.

Non-static (audiovisual) media are complex, for reasons involving many aspects and

technical factors beyond the scope of this doctoral dissertation. However, this section provides a

brief introduction to the nature of some types of these materials. This section is restricted to a

discussion of introductory information for some basics regarding some of these non-static

(audiovisual) media. Examples of some of these technical factors or specifications, and file

formats will be briefly discussed.

There are many technical factors related to digitizing audio materials. Sampling rate

represented in kilohertz (kHz), and bit depth are the two technical factors for digitized sound's

quality (Xie & Matusiak, 2016). *Sampling rate* was defined by Digital Preservation Office at the

University of Michigan Library (2014) as "how many times per second the sound wave is measured and is expressed in kHz" (p. 4). Feltner-Reichert et al. (2011) described *bit depth* in the context of digital audio as "range of numbers used to represent each amplitude measurement of a sampled sound wave" (p. 11). Furthermore, Leggett (2014) explained relevant terms related to audio data such as: 1) the recording's used number of bits refers to bit depth, and 2) being the recording in either mono sound (for recordings with a single microphone) or stereo (for recordings with two or more microphones) refers to *channel*.

Audio and video data have specific file formats for storage (Leggett, 2014). International Association of Sound and Audiovisual Archive (IASA) mentioned that preservation formats are not appropriate for delivery, and at the same time delivery file formats cannot be used for preservation purposes (IASA Technical Committee, 2009). IASA recommends using both WAVE (file extension .wav) and BWF formats for archival purposes, with the BWF being more acceptable and preferable for archiving (IASA Technical Committee, 2009). Regarding access files, MP3 is a popular delivery format (IASA Technical Committee, 2009). Similarly, BWF and WAV can be used for master files (uncompressed); both are suitable for preservation purposes, while MP3 is the most common derivative format for access files (Xie & Matusiak, 2016).

On the other hand, moving image materials were the subject of considerable attention in the literature. Video recordings and films are examples of moving images to which libraries are working on providing access, as well as preserving them (CARLI, 2017c). Requiring a playback machine for audiovisual resources, and their time-based nature represent their main difference from static media (Xie & Matusiak, 2016). Leggett (2014) mentioned that video materials are more complicated than audio materials, because video materials contain both sounds and images.

Many technical factors are related to moving images: resolution, scanning, aspect ratio, frame rate, sampling, and bit depth (Xie & Matusiak, 2016).

The lack of best practices and standards for digitizing moving images is one of the perceived barriers to digitizing archival moving images as reported by Gracy (2012). Due to the complexity of video digitization, the topic is not completely discussed in this section. Instead, much of the literature explained video digitization (Bogus et al., 2013; CARLI, 2017c; Xie & Matusiak, 2016). However, the fourth chapter (Section 4.1.1.2.) discusses the technical specifications for video digitization mentioned by the examined digitization guidelines during the document analysis process.

2.1.8. Digitization: challenges and suggested solutions

Challenges facing digitization represent one of the major topics discussed by the relevant literature (Conway, 1994; Iwhiwhu & Eyekpegha, 2009; Jagboro, et al., 2012; Keneley et al., 2016; Lee, 2001; Pandey & Misra, 2014). Establishing digitization projects is essential for many academic libraries and other institutions such as museums and archives. Lopatin (2006) mentioned that staffing, workflow, managing budgets, defining technical specifications, and metadata creation are required for effective project management in order to establish successful digitization projects since they are very complex. However, it is very common in many situations to encounter different challenges either before or after starting the digitization process. Various types of challenges may dramatically affect any digitization project.

Challenges facing digitization projects at academic libraries received special attention from researchers around the world. For instance, difficulties could be related to the technology used, skills required, and costs occurring within digitization processes (Keneley et al., 2016). Many challenges face digitization projects, such as: legal issues, changing software and hardware on a constant basis, funding, staff members' phobia towards computers, lack of appropriate technological infrastructure, technical expertise, and deteriorating digital media (Pandey & Misra, 2014). It is obvious that issues concerning funding, technology, staffing, and copyright represent examples of major categories regarding digitization challenges. The literature investigated such issues closely within different contexts, besides solutions were suggested to overcome these challenges successfully as discussed in the next sub-sections (Sections 2.1.8.1.-2.1.8.4.).

Digitization is facing serious challenges that cause dramatic effects in its application. This section reports on the challenges encountered and is divided into four sub-sections. The first (Section 2.1.8.1) discusses the funding challenges and their suggested solutions, while the second (Section 2.1.8.2.) describes the technology challenges regarding digitization, along with suggested solutions. The third sub-section (Section 2.1.8.3.) details staffing challenges and suggested solutions, while the fourth sub-section (Section 2.1.8.4.) provides an overview of copyright challenges and suggested solutions. All sub-sections will be discussed briefly in order to achieve a comprehensive representation and clarification regarding challenges encountered within the context of digitization.

2.1.8.1.   *Funding challenges and suggested solutions*

Academic Libraries have greater access to historical documents and other resources, as well as obtaining both foundation assistance and federal funds to participate in materials preservation (Liu, 2004). However, it is an expensive, difficult, and long-term process to build a digital library system and a digital preservation system (Alam, 2012). A large amount of funding is needed for digitization projects, since these projects are costly (Pandey & Misra, 2014). Funding issues may have a huge impact on both current and future digitization initiatives. It is one of the most common challenges facing digitization projects in various contexts described in the literature. In some cases, it was considered the main challenge for certain digitization projects. Logically, funding and financial constraints may negatively affect other factors of digitization projects, such as staff training and technology infrastructure.

From a statistical point of view, the Primary Research Group (2013) in its survey mentioned that the annual budget for digitization projects at college libraries reached $59,439, while $41,675 is the mean of digitization expenses spent by the participants in United States. Recent statistics by Primary Research Group Staff (2016) reported that the mean of the annual budget of college or university libraries for digitization projects reached $95,033.89, while $51,972.41 was the mean of the annual budget of the surveyed participants located in the United States. Clearly, the reported statistics by both Primary Research Group's (2013) and Primary Research Group Staff's (2016) show that the annual budget for digitization projects dramatically increased in the contexts of college or university libraries in United States within the short span of three years.

However, The Institute of Museum and Library Services (2006) mentioned that 40% of large academic libraries received funding to support their digitization activities. Many studies discussed the funding issue and its impact on digitization projects (Conway, 1994; Lee, 2001; Pandey & Misra, 2014; Potter & Holley, 2010). Digitization projects are very expensive in terms of money needed and time required (Lee, 2001). For instance, Ebdon et al. (1999) mentioned that the IFLA/UNESCO survey revealed US$7.72 is the average estimated per-page cost for digitizing. Also, acquiring digital imaging technology is expensive, the case as well for many other issues including funding maintenance contracts, needed labor, and systems upgrades (Conway, 1994). Funding the needed hardware, software, accommodation, and staff are examples of costs for in-house digitization (Lee, 2001). Also, the digitization process creates expenses such as maintenance and other costs for computer storage (Potter & Holley, 2010). Indeed, The Institute of Museum and Library Services (2006) found that lack of both staff time and funds were the greatest obstacles for digitization activities.

Solutions and recommendations to overcome these funding challenges were suggested by many studies. For instance, Kannappanavar et al. (2010) mentioned that most costs of digitizing library materials are spent on both the technical staff with the required expertise and other additional resources, whereas cataloging new materials adds more cost to the budget. Hence, it is recommended to include several categories for digitization projects' budgets such as: services and legal fees, maintenance, training the staff, and indirect costs (Pandey & Misra, 2014). Furthermore, not digitizing rarely used collections is recommended, because the costs cannot be justified regarding time, money, and resources (Kannappanavar et al., 2010). Similarly, other researchers and specialists came up with a variety of solutions to overcome funding issues facing digitization projects. For example, Ifijeh, Iwu-James, and Osinulu (2015) suggested practical

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solutions regarding newspaper digitization in Nigerian academic libraries through starting library advocacy programs to attract attention and gain help from the public, besides seeking financial funds for digitization programs from telecommunication companies and participating in library consortia.

2.1.8.2.   Technology challenges and suggested solutions

Each element of the digitization project is affected by technology, which is changeable in its nature (Purcell, 2016). Technological issues are experienced along different stages of the digitization process; they appear in varying levels of complexity as well. For instance, complicated technical challenges occur during digital image conversion (Conway, 1994). Furthermore, there are many technological issues such as: defining the digital image's size on the Web site owned by the library and using internal servers of the library to store thousands of image files, besides the reliability of the used software and equipment (Liu, 2004). Keneley et al. (2016) indicated that issues related to file sizes and quality are caused as a result of large photographs or letter books, which contain copies of correspondence on onion-skin paper.

There is a need to enhance the technology used for digitizing analog materials, in addition to addressing the needs of end-users through providing more efficient tools for transforming digital content (National Digital Library Program at the Library of Congress, n.d.). According to Amollo (2011), libraries should create standards for digitization, particularly for the intended processes, so interoperability will be ensured through standardization if libraries choose to cooperate. Regarding standardization, Kanyengo (2009) mentioned that costs will be reduced through having a uniform standardized preservation policy made by a consortia of

research institutions and universities. Also, Kumar and Sathya (2015) mentioned various digitization challenges with brief explanations such as: technology obsolescence, multilingual text support, and data size.

Digital materials are fragile and depend on technologies to maintain their viability (Flecker, 2003). However, original materials in the analog format should not be replaced by digital surrogates (Kannappanavar et al., 2010). Unfortunately, technical formats and media of old digital materials will be unusable as a result of rapid changes in technology (Flecker, 2003). Moreover, other technological issues may deal with the scanning process itself. Contact digitization, meaning that the scanner's glass touches the item's surface, is usually not allowed for digitizing delicate and rare items such as paintings; additionally the used lighting may damage these fragile items (Lee, 2001). Similarly, Bülow and Ahmon (2011) considered exposure to light as one of the risks occurring during imaging, because imaging systems use light sources that are more intense compared to the light used within an office context. Also, Bin (2006) reported the huge amount of data generated in the digitization process during digitizing Chinese newspapers as a challenge, whereas incomplete original data such as missing special symbols in PDF pages poses another challenge.

Recommendations, solutions, and suggestions were introduced by researchers to overcome this encountered technological challenge. For instance, Liu (2004) recommended avoiding having many steps, using easy equipment, avoiding removing the binding of books, along with having the feature of curvature correction in the used software for image processing. Moreover, using simple software applications like Paint Shop Pro for photo imaging, and mounted digital cameras instead of flatbed scanners, which became trendy, were ideas suggested

by Liu (2004). Liu's (2004) observation regarding the use of digital cameras may help in avoiding damage caused by contact digitization described earlier in Lee's (2001) research.

2.1.8.3.   Staff Skills challenges and suggested solutions

"There are many staff roles, each requiring different skills and abilities, that must work together to build a successful digital collection" (NISO Framework Working Group, 2007, p. 88). Staff skills are considered as one of the most serious challenges facing digitization. Many studies reported a critical gap in training staff to adequately handle digitization projects. For instance, Iwhiwhu and Eyekpegha (2009) found that 42.5% of the library staff did not receive any ICT training, whereas 70% of the respondents indicated that digitization projects are not managed by trained personnel. Similarly, Alhaji (2007) reported that 70% of the survey respondents had no prior digitization experience, making inadequate knowledge and skills one of the main challenges facing Nigerian university libraries. Also, Vrana (2010) mentioned that all surveyed public libraries in Croatia need more education in digitization and developing digital collections for their librarians. However, (Ifijeh et al., 2015) implied that having highly trained people to plan or implement digitization projects is missing, further, it is difficult and costly to locate information technology experts in Nigeria.

The mean number of man hours spent annually by staff and associated workers on digitization efforts in the United States reached 4,924.88, while the mean number of these man hours within the context of college and university libraries reached 4,317.81 (Primary Research Group Staff, 2016). It is worth mentioning that the Primary Research Group (2013) mentioned that the mean number of staff hours spent annually by departments on digitization in the United

States reached 2,935.98, while the mean number of these staff hours reached 4,761.21 within the context of college libraries. As a result, the recent statistics provided by Primary Research Group Staff's (2016) study show a dramatic increase in the man hours devoted annually for digitization effort in the United States. Based on the scope of this doctoral dissertation, these statistics reflect the importance of enhancing staff skills in digitization. However, 56.25% of the surveyed college and university libraries assumed that staff labor spent on digitization will remain the same over the next two years, 6.25% of them expected a drop, and 37.50% of them expected staff labor on digitization to increase (Primary Research Group Staff, 2016).

Resistance to change is a common matter facing staff regarding a digitization project (Pandey & Misra, 2014). Unfortunately, a considerable number of librarians do not have basic computer training, and specialized digitization training (Jagboro et al., 2012). From a practical perspective, Lampert and Vaughan (2009) of UNLV investigated success factors regarding digitization programs at 123 Association of Research Libraries member libraries. Although more than 40% of respondents reported receiving constant administrative support for the digitization program from the library's administration, skills related to promotion and marketing, as well as multimedia formats received the lowest rating averages (Lampert & Vaughan, 2009). However, The Institute of Museum and Library Services (2006) found that training current staff to maintain digitization activities is reflected only by 45.2% of academic libraries. However, Maroso (2005) indicated that online courses and workshops held at the Illinois Digitization Institute helped in producing better digitization professionals.

Fortunately, there are many other suggested solutions to overcome challenges related to staffing and relevant expertise. "Training is definitely a viable solution for lack of digitisation skills as this will reap immediate benefits in terms of increased productivity and raised

confidence" (Tanner, 2001, p. 335). For instance, there is a need for training on converting audio and video materials, as well as considering digital longevity and being prepared for this challenge (Maroso, 2005). In fact, training library staff in digitization is cheaper than using the outsourcing solution for a digitization project (Jagboro, et al., 2012). Supporting national digitization training on a constant basis, either by training models that are appropriate profit-making ones or seeking permanent funding for them, is recommended (Maroso, 2005).

Also, Alhaji (2007) suggested many recommendations such as staff training through workshops, seminars, and conferences. Moreover, Rafiq and Ameen (2013a) recommended providing the needed administrative and monetary supports for the staff to enhance human resources, in addition to providing seminars and training sessions in digitization. Furthermore, obtaining adequate ICT facilitates and building learning centers to enhance information access is recommended, as is ensuring publicity through advocacy programs and producing newsletters for digitization promotion and information dissemination (Alhaji, 2007).

2.1.8.4. Copyright challenges and suggested solutions

Copyright issues in digitizing library materials was discussed by many researchers (Anderson, 2001; Jones, 2005; Liu, 2004; Pandey & Misra, 2014). The Library of Congress considered intellectual property as the fifth challenge encountered in building an efficient digital library (Pandey & Misra, 2014). Based on US Copyright Law Section 108, making copies of works, including the copyrighted ones by libraries and archives, is applicable under certain conditions, additionally notice of copyright must be included by the library or archive, as well as copies must not be made for commercial advantage (Liu, 2004).

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Statements regarding copyright differ among institutions, although access and downloading for educational purposes - but not for commercial usage - is allowed by majority of those institutions (Liu, 2004). Nonetheless, solutions regarding copyright challenges were suggested by the literature within various contexts. Since rules and regulations are not standardized internationally, consulting a specialized copyright attorney in the area is recommended before starting a digitization project (Liu, 2004). For instance, Anderson (2001) mentioned that having copyright clearance for the selected materials is an essential step during digitizing scientific articles.

Other solutions to solve copyright issues were found in the literature as well. For instance, a copyright screening system, built within the digitization project The Making of Modern Michigan (MMM) inventory system, was used to identify the copyright status of selected materials for digitization based on United States copyright law (Jones, 2005). Moreover, two training videos were produced by MMM staff to explain the basics of copyright law, and examples of items from the Special Collections Division at Michigan State University were provided (Jones, 2005). Another example was provided by researchers from different countries regarding overcoming this challenge. For instance, (Ifijeh et al., 2015) mentioned that only historical and out of print newspapers with expired copyrights are digitized by libraries in developing countries to avoid violating publishers' rights.

It became obvious that rules regarding copyright laws may differ among countries as indicated by Liu's (2004) earlier discussion. These laws must be understood and followed carefully in order to avoid violating laws or the rights of parties involved in these materials. This doctoral dissertation is not focusing solely on copyright challenges, instead it aims to examine the overall challenges facing digitization projects. More information on copyright laws and

issues can be found through specialized external resources. Although copyright issues and solutions from other countries are mentioned in this section, this doctoral dissertation aims to examine digitization best practices and encountered challenges within the context of academic libraries located in the United States.

2.2. Chapter Summary

This doctoral dissertation focuses on digitization best practices conducted by academic libraries located in the United States. Thus, various aspects are related to the scope of this doctoral dissertation, such as digitization guidelines, digitization process, access and preservation. Earlier in this chapter, these aspects were discussed through an examination of relevant literature. Initiating a discussion regarding these aspects by exploring the relevant literature was achieved to establish a basic understanding.

Issues related to digitization took a place in this chapter. Many aspects related to digitization were introduced and described for clarification. These aspects concern the importance of digitization for access and preservation, the digitization process, digitization of both static and non-static (audiovisual) media, and digitization guidelines. Finally, challenges facing digitization were discussed. The chapter briefly provided a few solutions to some of the described challenges.

Chapter 3 Research Methodology

Exploring the best practices applied to digitization within the context of academic libraries in the United States is the main scope of this doctoral dissertation, as is examining and comparing the levels of compliance, availability, and usefulness reported by academic librarians. Challenges encountered in digitizing static and non-static (audiovisual) media and solutions are examined in order to gain a better understanding of both within the context of academic libraries in the United States. Therefore, five research questions were developed, addressed in the first chapter of this doctoral dissertation (Section 1.3.), in order to come up with satisfactory answers after performing data collection and analysis. This chapter describes the adopted research methodology based on mixed methods research, particularly the explanatory design.

Seeking IRB approval from University of Wisconsin-Milwaukee was essential prior to gathering both quantitative and qualitative data. This research study has IRB# 18.148 from the Institutional Review Board at University of Wisconsin-Milwaukee. Gravetter and Forzano (2012) defined an Institutional Review Board (IRB) as "a committee that examines all proposed research with respect to its treatment of human participants. IRB approval must be obtained before any research is conducted with human participants" (p. 127). Applying for IRB approval must be completed before starting the research project, and determining the level of risk that may affect participants' social, physical, and psychological aspects represents the first step that must be taken during the planning phase of obtaining IRB approval (Teddlie & Tashakkori, 2009). Moreover, it is important to inform the IRB that identifying information will be gathered during the quantitative phase in order to facilitate the follow-up process (Creswell & Clark, 2011).

3.1. Research Design

This explanatory design aims to explore digitization best practices adopted by academic libraries in the United States for both static and non-static (audiovisual) media. Compliance levels with digitization guidelines reported by academic librarians are also examined. Additionally, it aims to explore challenges academic librarians face in digitizing static and non-static (audiovisual) media, as well as comparing the challenges posed in digitization of the different media types. Applied and suggested solutions regarding these challenges are also investigated.

To put it in another way, this doctoral dissertation aims to survey digitization best practices among academic libraries in the United States for both static and non-static (audiovisual) media. Then, it compares the digitization guidelines, compliance levels, challenges, and solutions related to digitization of static and non-static (audiovisual) media. A mixed methods design has been adopted, particularly an explanatory design through handling quantitative and qualitative data within several stages. Regarding the explanatory design, Creswell and Clark (2011) said "The data analysis procedures in the explanatory design involve first collecting quantitative data, analyzing the data, and using the results to inform the follow-up qualitative data collection" (p. 221).

Hence, the phases and steps of this doctoral dissertation are organized based on the explanatory design. The chronological order of these steps are: 1) defining research questions, 2) analyzing documents of digitization guidelines, 3) seeking IRB approval, 4) applying purposive sampling for the quantitative phase, 5) collecting quantitative data through an electronic questionnaire, 6) analyzing the quantitative data, 7) defining the questions for the semi-structured

interviews, 8) applying purposive sampling for the qualitative phase, 9) conducting the semi-structured interviews, 10) analyzing the qualitative data, and 11) reporting the final results.

Strengths and weaknesses are associated with this methodology. Creswell and Clark (2011) mentioned many strengths of the explanatory design. These strengths are: it can be implemented and written in a straightforward way since it has two-phase structure, it has a strong quantitative orientation at the beginning, and the gained experience from the first phase helps in designing the second one (Creswell & Clark, 2011). Consequently, it is clear that this doctoral dissertation has many of these strengths, all of which are mentioned in this paragraph.

Indeed, this dissertation follows the explanatory design, which means that it has two sequential phases. The first phase is the quantitative one, using the questionnaire technique to collect quantitative data. The second phase is qualitative, and using the techniques of both document analysis and semi-structured interviews to collect qualitative data. Collecting both quantitative and qualitative data adds considerable depth and richness to the final results. Also, each phase can be handled separately on a sequential basis, providing the opportunity to design the qualitative phase based on the quantitative results.

However, the specialized literature reported many challenges encountered in adopting the explanatory design. Demanding a lengthy amount of time for conducting the study, determining the quantitative results requiring additional examination, and determining the selection criteria of participants for the qualitative phase are examples of some of these challenges (Creswell & Clark, 2011). As a result, this dissertation has a time-frame for conducting both phases, so quantitative data collection took place during spring 2018 semester. The electronic questionnaire was activated online for 46 days during this time. Questionnaire responses were analyzed

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electronically using *IBM SPSS Statistics 25* and *NVivo 11* for faster analysis. Then, semi-structured interviews were conducted for 10 subjects during the same semester. NVivo 11 was used to analyze the semi-structured interviews.

The qualitative phase examined specific themes such as: 1) digitization technical specifications, 2) digitization guidelines, 3) levels of usefulness, availability, and compliance with digitization guidelines, 4) digitization challenges, 5) applied solutions, 6) desired solutions, 7) comments, 8) suggestions for improving current digitization guidelines, and 9) suggestions for improving digitization. Regarding selection of subjects for the qualitative phase, purposive sampling was adopted. Diversity was a priority, and efforts were made to ensure that the study was recruiting interviewees from different states, universities, and those using differing digitization guidelines. This selection criteria helped in shedding light on digitization from different perspectives in order to facilitate more a detailed examination.

In conclusion, it is assumed that an explanatory design is highly suitable for the scope of this doctoral dissertation. It helps in collecting a rich amount of quantitative data, which facilitates more accurate generalization for the final results. Also, the qualitative phase can be designed after completing quantitative data collection and analysis. This means better treatment for the missing quantitative data can be achieved. In other words, the qualitative phase can be designed to seek information not collected in the quantitative phase. Moreover, exploring digitization guidelines, compliance levels, encountered challenges, and appropriate solutions can be systematically achieved by adopting the explanatory design. This design enables mainly collecting the necessary information in the quantitative phase, whereas further examination can take place in the qualitative phase.

3.2. Sampling

Creswell and Clark (2011) said regarding sampling in the explanatory design that "sampling occurs at two points in this design: in the quantitative phase and in the qualitative phase. In this design, the quantitative and qualitative data collections are related to each other and not independent" (p. 185). Also, the participants in the qualitative follow-up phase must have already participated in the quantitative data collection (Creswell & Clark, 2011). Obtaining details from few cases is the reason leading researchers to use purposive sampling (Teddlie & Tashakkori, 2009). Hence, recruiting subjects through purposive sampling was applied for both the quantitative and qualitative phases. Purposive sampling was applied for the three data collection techniques adopted in this doctoral dissertation, these are: 1) document analysis, 2) electronic questionnaire, and 3) semi-structured interviews.

Regarding sampling for the document analysis technique, purposive sampling was applied through determining many selection criteria to choose documents for analysis. Source, location, content, and date represent the main selection criteria. First, identifying the source of the document is the first step for evaluating it. Only national and regional digitization guidelines issued by institutions located in the United States were selected, because the context of this doctoral dissertation focuses on digitization best practices by academic libraries in the United States.

These digitization guidelines may differ in their length, structure, and content. The content of the digitization guidelines was another criterion for selection. Most digitization guidelines contain a variety of topics related to digitization, such as digital preservation, quality

control, metadata, and so on. Only sections related to digitization technical specifications and file formats were analyzed. Hence, a total of five digitization guidelines were analyzed for this doctoral dissertation, with the time coverage of the selected digitization guidelines starting in 2004 and running until 2017.

Purposive sampling was applied for the electronic questionnaire and semi-structured interviews to select subjects. Among other libraries, academic libraries in the United States represent the majority of digitization projects for many reasons (Liu, 2004). Only doctoral universities with the highest and higher research activity based on 2015 classifications issued by The Carnegie Classification of Institutions of Higher Education were selected. Doctoral universities represent the institutions which awarded, during the update year, a minimum of 20 research or scholarship doctoral degrees with exclusion of professional practice doctoral-level degrees like MD and JD; both the tribal colleges and special focus institutions are also excluded (Carnegie Classifications | Basic Classification, 2017). This sampling technique was selected for this dissertation because it was assumed that universities with high levels of research activities are: 1) more likely to have active digitization projects, 2) have the availability of sufficient funding for such projects, and 3) are in possession of larger collections that can be digitized.

The Carnegie Classification of Institutions of Higher Education has three classifications for doctoral universities based on their research activity: highest, higher, and moderate (Carnegie Classifications | Listings, n.d.). However, universities classified as both highest and higher research activity were selected for this doctoral dissertation. There are 115 doctoral universities representing the highest classification for research activity (Carnegie Classifications | Standard Listings, n.d.a). Also, there are 107 doctoral universities representing the higher classification for

research activity (Carnegie Classifications | Standard Listings, n.d.b). Hence, a total of 222

universities represent the sample selected for this doctoral dissertation.

The websites of the libraries of these 222 doctoral universities (hereinafter mentioned as

"universities" except if cited from a resource or explained) with the highest and higher research

activity were then visited to collect needed information about library staff engaged with

digitization efforts. For those websites not providing the needed information clearly enough,

phone calls were made as an alternative solution. Two universities were not included in this

study, because the study-required staff information was not obtained, although these two

universities were contacted by phone, and either email or webform.

After collecting the subjects' information, the electronic questionnaire was sent by email

to the subjects at these 220 universities, with each subject from a different university. An email

invitation was designed for the electronic questionnaire (See Appendix B) with more details

about the study and participation requirements. One requirement was being a full-time staff

member working primarily on digitization at a library that has created a minimum of ten digital

collections. Although this selection criterion may reduce response rates, it was assumed that it

may help in collecting data from library staff more experienced in digitization.

The email invitation was customized for each subject by assigning a unique subject

number. This strategy helped in many aspects, such as sending electronic questionnaire

reminders and interview invitations, recruiting interviewees, and managing incentives. The letter

S and the associated subject number (e.g., S1) are used in referring to direct quote(s) from each

subject. However, after completing data collection, it was determined that seven subjects in the

electronic questionnaire had entered the IRB number (i.e., 18.148) instead of their subject

numbers. For that reason, the sentence "Unspecified Subject Number" is used to refer to quotes from these subjects.

Receiving more responses for the electronic questionnaire helped in producing more detailed and accurate results for the quantitative phase. Many strategies were taken in order to increase the response rate of the electronic questionnaire, such as: 1) using an electronic questionnaire to reach distant subjects, 2) assigning subject numbers instead of collecting identifying information, 3) asking direct and main questions, 4) using simple and clear language, 5) allowing 46 days to collect responses, 6) sending five reminder emails, and 7) providing incentives through a drawing in which ten winners were selected.

After sending the electronic questionnaire to 220 recipients, one subject was unable to participate due to not meeting the participation requirements detailed in the invitation email. As a result, the total sample of the electronic questionnaire was reduced to 219 subjects. Participation in the electronic survey was voluntary, subjects were able to quit the electronic questionnaire at any time. Questions regarding age, gender, and most recent academic degree were optional and could be skipped by the subjects.

Regarding the received responses, subjects (N=78) who selected "Yes" on the consent form of the electronic questionnaire were able to start answering the questions. Only two responses were redirected to skip the electronic questionnaire, because they selected "No" on the consent form. A total of eight responses only agreed to the consent form without answering any more questions, whereas only two responses agreed to the consent form and responded to the subject number question. By eliminating these 12 responses, the number reached 68 out of 219

subjects. In other words, the response rate for this electronic questionnaire is 31.05%. Table 3.1

shows the demographic data of the 68 subjects in the electronic questionnaire:

Table 3.1
Demographic Data of the Subjects in the Electronic Questionnaire (N=68)

Measurement		Count	Percentage
Age			
	18-29	7	10.29%
	30-39	23	33.82%
	40-49	19	27.94%
	50-59	13	19.12%
	60-69	6	8.82%
	70 or more	0	0%
Gender			
	Female	49	72.06%
	Male	19	27.94%
	Other	0	0%
Most Recent Academic Degree			
	High School	1	1.47%
	Bachelor	11	16.18%
	Master	53	77.94%
	Doctoral	3	4.41%
	Other	0	0%

Subjects were asked to indicate the state in which their academic university is located by

giving them 52 multiple choices. Only 64 subjects answered this question. Responses were

collected from all the different areas in the United States without being limited to selected

regions. Table 3.2 shows the states selected by the subjects in the electronic questionnaire:

Table 3.2

The States that Subjects' Academic University is Located

State	Count	Percentage		State	Count	Percentage
AK	1	1.47%		MT	0	0%
AL	2	2.94%		NC	2	2.94%
AR	1	1.47%		ND	0	0%
AZ	1	1.47%		NE	0	0%
CA	3	4.41%		NH	1	1.47%
CO	4	5.88%		NJ	0	0%
CT	1	1.47%		NM	1	1.47%
DC	1	1.47%		NV	1	1.47%
DE	1	1.47%		NY	1	1.47%
FL	2	2.94%		OH	4	5.88%
GA	2	2.94%		OK	2	2.94%
HI	0	0%		OR	0	0%
IA	0	0%		PA	3	4.41%
ID	0	0%		PR	0	0%
IL	4	5.88%		RI	0	0%
IN	1	1.47%		SC	0	0%
KS	1	1.47%		SD	1	1.47%
KY	2	2.94%		TN	0	0%
LA	0	0%		TX	2	2.94%
MA	4	5.88%		UT	3	4.41%
MD	2	2.94%		VA	2	2.94%
ME	0	0%		VT	0	0%
MI	2	2.94%		WA	0	0%
MN	1	1.47%		WI	2	2.94%
MO	1	1.47%		WV	0	0%
MS	2	2.94%		WY	0	0%
No Response	4					5.88%
Total		68				100%

The sixth question in the electronic questionnaire asked the subjects to enter their current job titles. A total of 68 responses were collected for this optional open-ended question. Open coding for the collected qualitative data was conducted through using NVivo 11 to analyze the main terms of these job titles. A total of 11 job titles included either the term "*Archivist*" or "*Archives,*" whereas only two job titles from these 11 included the terms "*Digital.*" A total of

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nine job titles included the phrase "*Digital Collection,*" whereas only 4 job titles included the phrase "*Special Collections.*" A total of 23 Job titles included at least one of the following terms "*Digital Initiatives,*" "*Digital Library,*" "*Digital Production,*" "*Digital Projects,*" "*Digital Scholarship,*" or "*Digital Services.*" Also, the qualitative analysis investigated the occurrence of the term "*Digitization*" and other similar words like "*Conversion,*" "*Imaging,*" "*Reformatting,*" and "*Scanning.*" It was found that only nine job titles contained the term "*Digitization,*" whereas other eight job titles included at least one of the following terms: "*Conversion,*" "*Imaging,*" and "*Reformatting.*" Only two job titles included the term "*Metadata,*" whereas a total of ten job titles included at least one of the following terms: "*Associate,*" "*Head,*" "*Digital,*" "*Director,*" "*Librarian,*" "*Officer,*" "*Specialist,*" and "*Systems.*"

Subjects were asked about their years of experience working with digitization. Only 65 subjects answered this open-ended question. Table 3.3 shows a categorization for the collected results:

Table 3.3
A Categorization for the Reported Number of
Years Working with Digitization

Number of Years	Count
5 Years or Less	21
6-10 Years	18
11-15 Years	13
16-20 Years	9
21-25 Years	3
26-30 Years	1
No Response	3
Total	68

Subjects were asked to rate their expertise in digitization using a 7-point Likert scale question. Choosing 1 indicated *Not At All Expert*, whereas choosing 7 indicated *Extremely Expert*. Table 3.4 shows a descriptive analysis based on the collected responses from the subjects:

Table 3.4
A Descriptive Analysis of Subjects' Digitization Expertise Based on a 7-Point Likert Scale

Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count*
1.00	7.00	5.09	1.31	1.72	67

One Subject out of 68 did not answer this question.

Figure 3.1 is a pie chart that shows the percentages of the selected choices by the subjects for the same previous question regarding the subjects' expertise in digitization:

Pie chart with legend:

■ No Response   ■ 1 (Not At All Expert)   ■ 2   ■ 3   ■ 4   ■ 5   ■ 6   ■ 7 (Extremely Expert)

Pie slice labels:
- 7 (Extremely Expert) 10.29%
- No Response 1.47%
- 1 (Not At All Expert) 1.47%
- 2 4.41%
- 3 5.88%
- 4 11.76%
- 5 33.82%
- 6 30.88%
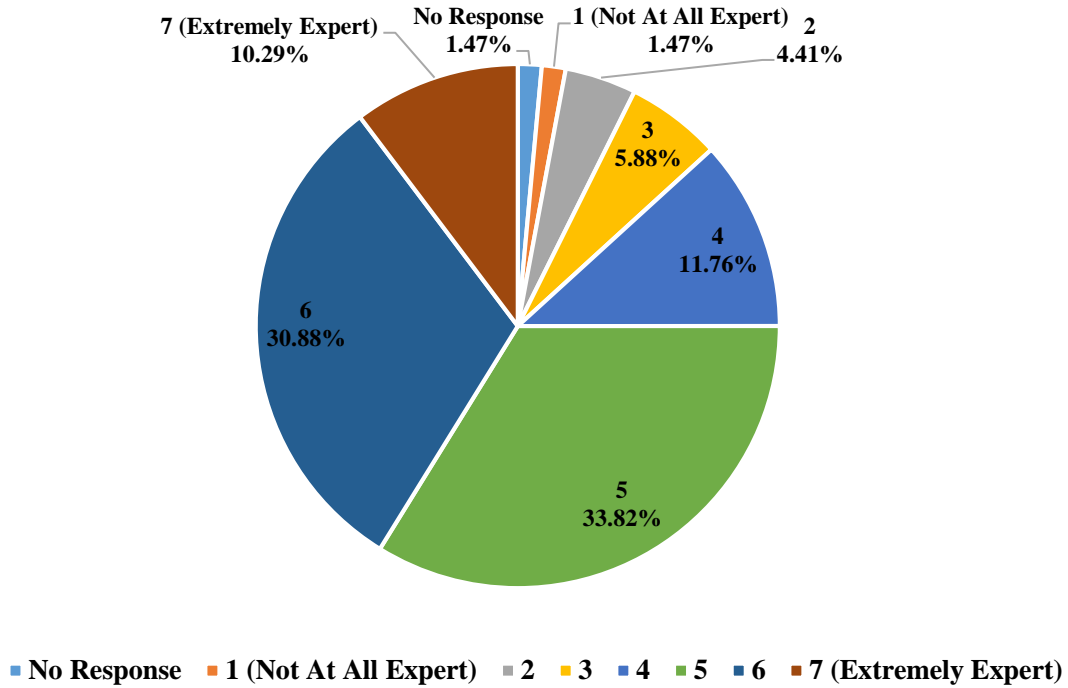
Figure 3.1 A pie chart for the selected rating scales regarding subjects' expertise in digitization

Purposive sampling was applied for the semi-structured interviews to recruit interviewees based on the diversity of states, universities, and digitization guidelines. Two steps were taken to recruit interviewees. First, the electronic questionnaire included a paragraph at the end inviting the subject to participate in the qualitative phase of the study (See Appendix C). Second, two interview invitation emails (See Appendix D) with approximately 7 days between each round were sent to the subjects in the electronic questionnaire through tracking their subject numbers. A total of ten interviewees was recruited for the semi-structured interviews, with each interviewee from a different university. Table 3.5 shows the demographic data of the interviewees:

Table 3.5

Demographic Data of the Subjects in the Semi-structured Interviews (N=10)

Measurement		Count	Percentage
Age			
	18-29	0	0%
	30-39	5	50%
	40-49	3	30%
	50-59	2	20%
	60-69	0	0%
	70 or more	0	0%
Gender			
	Female	9	90%
	Male	1	10%
	Other	0	0%
Most Recent Academic Degree			
	High School	0	0%
	Bachelor	1	10%
	Master	9	90%
	Doctoral	0	0%
	Other	0	0%

Table 3.6 shows the states where the interviewees' academic university is located:

Table 3.6

The States where the Interviewees' Academic University is Located (N=10)

State	Count	Percentage
CA	1	10%
GA	1	10%
IL	1	10%
KY	1	10%
MA	1	10%
MD	1	10%
NY	1	10%

OH	1	10%
UT	1	10%
WI	1	10%

Incentives were offered for the subjects to achieve an appropriate response rate for the electronic questionnaire and semi-structured interviews. Regarding incentives for the electronic questionnaire, there was a drawing for ten Amazon.com gift cards (each gift card equaled $50) participating in the electronic questionnaire. Subjects were able to enter the drawing even if they did not participate in the online survey by sending their names and email addresses to the researcher's email address. Regarding incentives for the semi-structured interviews, each interviewee received a $30 Amazon.com gift card after completing the semi-structured interview.

3.3. Data Collection

Creswell and Clark (2011) mentioned, regarding the explanatory design, that quantitative data is collected and analyzed, then followed by the follow-up qualitative data collection, which is identified based on the analyzed results of the quantitative data. Sampling occurs twice: once in the quantitative phase and again in the qualitative phase (Creswell & Clark, 2011). Figure 3.2 represents the chronological order of the three data collection techniques applied in this doctoral dissertation:
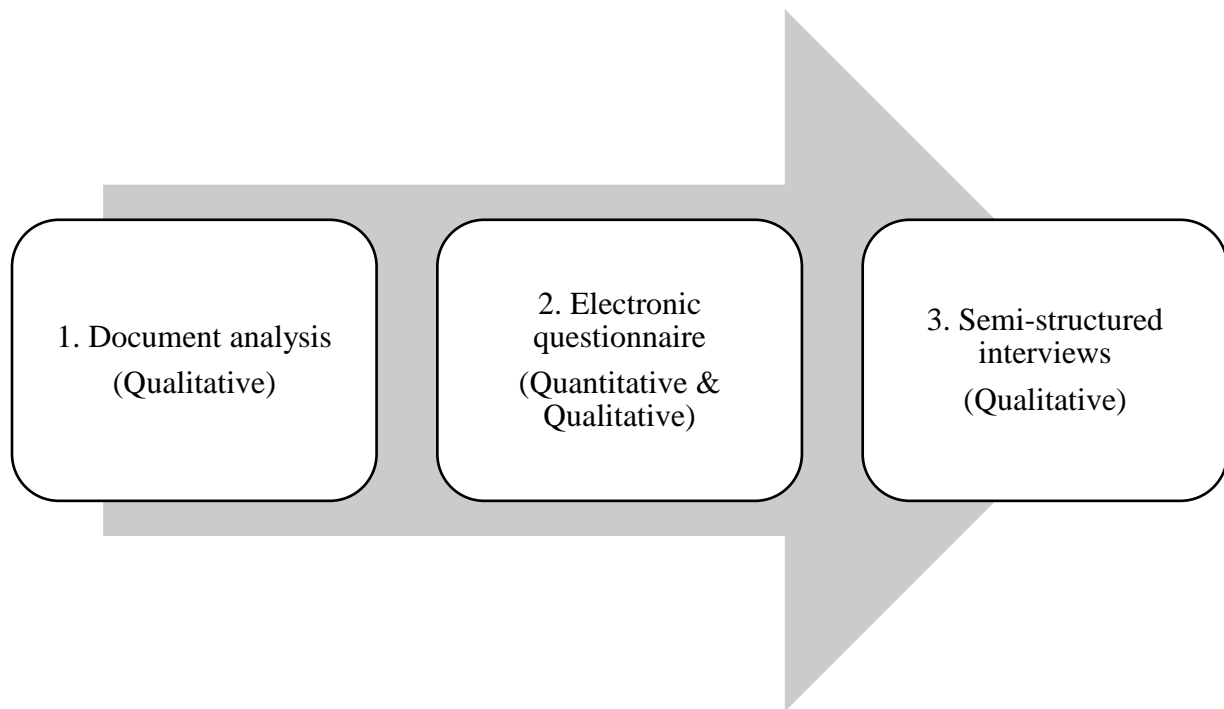
Figure 3.2 Chronological order of the data collection techniques applied in this doctoral dissertation

3.3.1. Document analysis

Document analysis is the first data collection technique conducted at the beginning of this doctoral dissertation. This technique helps in building a comprehensive understanding regarding the needs of these academic libraries in practicing digitization. Examining digitization guidelines issued by different agencies, archives, associations, consortia, and institutions aids in understanding how digitization best practices are defined in different contexts. The goal of selecting these digitization guidelines is to understand the digitization recommendations and conduct document analysis (Sections 4.1.1.1. and 4.1.1.2.) in the fourth chapter of this doctoral dissertation.

There are many digitization guidelines, such as *ISO/TR 13028:2010 "Information and documentation - Implementation guidelines for digitization of records,"* but restricted access and cost were two reasons for excluding this document from being analyzed for this doctoral dissertation. Instead, many other digitization guidelines were found on the internet, by using the Google search engine (URL: https://www.google.com/), and through conducting several online searches. Only national and regional digitization guidelines issued by institutions in the United States were selected, since this study focuses exclusively on academic libraries in the United States. Selecting these two types of digitization guidelines helped in examining guidelines that might be more popular and more readily adopted than those published by local universities or archives. This means that digitization guidelines issued by local states, universities, or archives were not selected. As a result, the selected digitization guidelines had publication or revision dates ranging from 2004 till 2017.

Digitization guidelines were intentionally chosen to reflect different contexts. Digitization guidelines issued by different institutions were selected for document analysis. This variation of contexts helped in understanding the needs of these contexts from digitization, as well as creating a wider image regarding digitization implementation in different contexts. Also, there remains a possibility that these different digitization guidelines might be adopted by the examined universities. Most examined digitization guidelines contain sections related to different digitization practices such as metadata, quality control, used software, and others. However, only sections dealing with technical specifications and file formats were examined closely for this document analysis. Other sections of those guidelines (e.g., file naming, metadata, quality control, and software) are beyond the scope of this doctoral dissertation.

A total of five digitization guidelines issued by specialized institutions in the United States were selected. One of the examined digitization guidelines (i.e., CARLI) has five documents, so a total of nine documents were included in the document analysis. These guidelines represent the selected sample for this study, but not the entire population. Also, it is not guaranteed whether they are adopted by academic libraries in the United States. These guidelines were analyzed, and briefly discussed in the fourth chapter of this doctoral dissertation (Sections 4.1.1.1. and 4.1.1.2.) as a first step of data collection process. The following list shows the sources of the examined digitization guidelines arranged by alphabetical order, whereas the titles of these documents are italicized:

1. ALCTS: Association for Library Collections and Technical Services (*Minimum digitization capture recommendations*)

2. BCR's CDP Digital Imaging Best Practices Working Group (*BCR's CDP digital imaging best practices*)

3. CARLI: Consortium of Academic and Research Libraries in Illinois (*Guidelines for the creation of digital collections: Digitization best practices for audio, Guidelines for the creation of digital collections: Digitization Best Practices for Images, Guidelines for the creation of digital collections: Digitization best practices for moving images, Guidelines for the creation of digital collections: Digitization Best Practices for Text, and Guidelines for the creation of digital collections: Digitization Best Practices for Three-Dimensional Objects*)

4. FADGI: Federal Agencies Digital Guidelines Initiative (*Technical guidelines for digitizing cultural heritage materials: Creation of raster image files*)

5. NARA: National Archives and Records Administration (*NARA Technical guidelines for digitizing archival materials for electronic access: Creation of production master files – raster images*)

More digitization guidelines were included in the electronic questionnaire designed for this doctoral dissertation (Appendix C). For instance, Question 17 included a choice concerning digitization guidelines from the International Federation of Library Associations and Institutions (IFLA) (referring to the *Guidelines for Planning the Digitization of Rare Book and Manuscript Collections* from URL: https://www.ifla.org/files/assets/rare-books-and-manuscripts/rbms-guidelines/guidelines-for-planning-digitization.pdf). Also, Question 31 included a choice regarding the digitization guidelines from the International Association of Sound and Audiovisual Archives (IASA) along with other choices. The reason for providing more digitization guidelines in the electronic questionnaire is that these guidelines might be adopted by the examined academic libraries. Further, it was noted that static media digitization is discussed by more guidelines as compared to non-static (audiovisual) media. Consequently, the electronic questionnaire listed eight choices of digitization guidelines for static media, whereas fewer choices were mentioned for non-static (audiovisual).

Document analysis has many strengths and weaknesses as a data collection technique. In the context of this doctoral dissertation, identifying official digitization guidelines by various institutions is a major strength. Hence, electronic documents that were published by specialized institutions were examined to achieve a high level of authenticity. Several national and regional digitization guidelines were analyzed during the document analysis process. Further, much important information was contained in the examined documents, such as file formats, technical specifications, digitization phases, and other topics.

Unfortunately, some weaknesses were also identified during the process of document analysis. For instance, the examined five digitization guidelines for this doctoral dissertation differ in their structure, scope, length, detail, and content. Consequently, a selective examination was applied in order to achieve parallel analysis of all five digitization guidelines. In other words, sections regarding file formats and technical specifications of those digitization guidelines were purposively selected for the analysis process (Sections 4.1.1.1. and 4.1.1.2). Furthermore, attention was paid to selecting the most recent versions of these digitization guidelines where applicable in order to include the most current and updated information.

3.3.2. Questionnaire

There are many advantages to the questionnaire, among them: the mail questionnaire collects "frank answers" (Powell, 1997, p. 90), facilitates easier collection and analysis of quantitative data, and large amounts of data can be collected within a short time (Powell, 1997). The electronic questionnaire is applied as a quantitative data collection technique in this doctoral dissertation (see Appendix C). There are three reasons for using the electronic questionnaire in this doctoral dissertation, which are: 1) reaching distant subjects located in different states, 2) collecting the largest possible amount of data needed for descriptive and inferential statistics, 3) addressing closed-ended and open-ended questions easily to facilitate faster and more accurate data collection and analysis.

The electronic questionnaire was designed via *Qualtrics Survey Software* (URL: https://www.qualtrics.com/). The link of the electronic questionnaire was sent by email invitation (See Appendix B) to the 220 subjects; each subject was from a different university. Voluntary

participation was granted for the electronic questionnaire, which means that subjects could withdraw at any time. Responses were collected from February 14, 2018 until March 31, 2018 (46 days). Five electronic reminders were sent through the email to the subjects approximately every 7-10 days in an effort to increase the response rate.

The electronic questionnaire had three major sections: 1) *Demographic & General Information*, 2) *Digitization of Static Media*, and 3) *Digitization of Non-static (Audiovisual) Media*. The questions of the second and third sections were almost identical to draw comparisons between these sections during the data analysis process. In general, the electronic questionnaire had 44 questions distributed among all the sections. These questions were either mandatory (i.e., 1, 20, 21, 23, 25, 27, 28, 35, 36, 38, 40, 42, and 43) or optional. The electronic questionnaire had a combination of closed-ended and open-ended questions.

It was important to have closed-ended questions for most of the questions (e.g., Likert scale, multiple choice, and check all that apply) to reach a higher accuracy and faster data analysis. Teddlie and Tashakkori (2009) mentioned that Likert scale is a 5-point scale to examine a respondent's level of either agreement or disagreement towards several items related to a topic. Instead, this doctoral dissertation used the 6-point and 7-point scales in the electronic questionnaire to conduct inferential statistical analysis (e.g., the Wilcoxon Signed Ranks Test [two-tailed]). Therefore, questions 19, 22, 24, 34, 37, and 39 in the electronic questionnaire were designed based on the 6-point Likert scale, whereas the statements in questions 26 and 41 (e.g., "University staff need more professional training on digitization skills for static media" in Question 26) were designed based on the 7-point Likert scale.

On the other hand, open-ended questions help in collecting qualitative data. For example, there was an open-ended question asking the subjects to provide reasons for their compliance with the selected digitization guidelines for static media. The open-ended questions were distributed among the three sections of the electronic questionnaire to collect more in-depth qualitative data. Also, the first section had a question that facilitates the possibility that subjects who indicated that their universities have a digitization plan have the ability to upload that plan into the electronic questionnaire. The last question in the electronic questionnaire asked the subjects to share any further comments which may help in identifying related issues not covered in the previous questions.

Questionnaires have many strengths, a reason researchers often favor them as a data collection technique. Questionnaires tend to be inexpensive, measuring attitudes in a good way, analyzing closed-ended questions easily, and turnaround quickly (Johnson & Turner, 2003). For these reasons, Qualtrics Survey Software was used to distribute the electronic questionnaire to the target sample, saving time and expenses. Also, subjects' attitudes can be measured in a fairly precise way, such as using the Likert scale to check subjects' attitudes.

There are some drawbacks to using questionnaires as a data collection technique. For example, personal contact between researcher and participant is absent, and qualifying answers for unclear questions cannot be ascertained by the participant (Powell, 1997). Other drawbacks include a low response rate, that they must be designed to be short, the possible occurrence of missing data, missing responses to selective items, and that analyzing open-ended questions consumes time (Johnson & Turner, 2003). For these reasons, the electronic questionnaire was short and questions were consciously constructed to be simple as a way to avoid misunderstanding. Also, five electronic reminders were sent via email to subjects on a regular

basis in an effort to maximize the response rate. Regarding missing data and responses, interviews were conducted to collect missing data in the electronic questionnaire. Further, a limited number of open-ended questions were addressed in the electronic questionnaire in order to avoid difficulties and save time during data analysis.

3.3.3. Semi-structured interviews

Semi-structured interviews represent the third data collection technique used in this doctoral dissertation. The main purpose of using semi-structured interviews is to collect in-depth data not gathered through the electronic questionnaire. Interviews provide a great chance to reveal complex information, whereas the personal contact encourages participants to fully respond (Powell, 1997). Therefore, this data collection technique represents a perfect tool to collect intensive data regarding specific themes that were addressed by this doctoral dissertation.

Asking open-ended questions during the semi-structured interviews helped in collecting more data that may not have been collected by the electronic questionnaire. The semi-structured interviews discussed different topics (See Appendix F) related to digitization, such as: 1) digitization challenges, 2) applied solutions, 3) suggested solutions, and 4) suggestions to enhance digitization guidelines for digitizing static and non-static (audiovisual) media. Ten interviewees were recruited for semi-structured interviews; each interviewee was from a different university. Interviewees were located in different states, so were asked for their preferences to conduct the semi-structured interview either online or over the telephone. A total of nine semi-structured interviews were conducted over the telephone and one semi-structured interview was conducted online over *Skype*.

Interviews have many strengths as a data collection technique. Interviews are adopted in order to seek in-depth qualitative data, as well as to ask individuals about their opinions and feelings regarding current situations and future predictions (Pickard, 2007). There are other strengths of interviews, among them: the turnaround of telephone interviews is very fast, reaching a high response rate, they are very beneficial for both confirmation and exploration, and measuring attitudes in a good way (Johnson & Turner, 2003). Consequently, open-ended questions were used when querying interviewees regarding important issues, particularly the challenges of and solutions regarding digitization. These open-ended questions helped in exploring other issues not covered earlier.

Although semi-structured interviews represent a powerful tool for collecting data, they suffer from some weaknesses. For instance, Powell (1997) mentioned that it is easier for persons interviewed by phone tend to end the interview before it is completed. Therefore, two steps were taken to overcome the weaknesses of this data collection technique. First, appointments for conducting these interviews were scheduled with the interviewees based on their convenience. Second, open-ended questions were limited in number and clear in wording to keep the interviewees interested.

There are also many limitations to interviews as a data collection technique. Some of these weaknesses are: low perceived anonymity by the respondents, validation needed for measurement, analyzing open-ended questions consumes time, and investigator effects are possible (Johnson & Turner, 2003). Consequently, as many steps as possible were taken to avoid these issues. Regarding anonymity, subject numbers were used for the interviewees in order to protect their privacy (e.g., S1 mentioned the following suggestions to overcome digitization challenges). Regarding improving validity, triangulation was applied by asking a colleague to

check the analysis of two interviews. Also, open-ended questions were addressed directly to the interviewee to avoid investigator effects. Finally, NVivo 11, a data analysis software program, was used to analyze the collected qualitative data.

In all, three data collection techniques were applied to collect data: document analysis, an electronic questionnaire, and semi-structured interviews. Triangulation of data collection techniques helped in collecting quantitative and qualitative data about the same concept in order to acquire a more detailed understanding. For instance, digitization challenges and suggested solutions were discussed in the electronic questionnaire and semi-structured interviews. This helped in examining digitization challenges and suggested solutions more closely. Triangulation is discussed in greater detail in the section subtitled *Internal and external validity* (Section 3.5.1.).

3.4. Data Analysis

Regarding data analysis and interpretation in the explanatory design, Creswell and Clark (2011) said "Key data analysis decisions relate to how to use the quantitative analysis to identify participants to determine what results will be explained qualitatively, and to decide how the qualitative results explain the quantitative results" (p. 221). Hence, there are two separate stages of analyzing collected data for this doctoral dissertation, which concern both quantitative and qualitative results.

Further, this dissertation is also a comparative study, which aims to compare the collected data of the levels of compliance, availability, and usefulness of digitization guidelines reported by academic librarians for static versus non-static (audiovisual) media. Additionally, it compares

the challenges facing digitization of static and non-static (audiovisual) media, as well as applied

and suggested solutions for exploring differences. Again, this dissertation follows the

explanatory design, where both quantitative and qualitative data collection techniques are

applied. Table 3.7 represents the applied techniques for data collection and analysis adopted for

this doctoral dissertation.

Table 3.7
Methods of Data Collection & Analysis

Research Questions	Data Collection Techniques	Data Analysis Techniques

1) How do academic libraries comply with digitization guidelines and associated reasons?
  A) What are the digitization guidelines and technical specifications adopted by academic libraries for digitizing static and non-static (audiovisual) media?
  B) To what extent do academic libraries comply with digitization guidelines and what are the associated reasons?
  C) To what extent is the availability of the digitization guidelines and what are the associated reasons?
  D) To what extent is the usefulness of the digitization guidelines and what are the associated reasons?
	1) Document Analysis
	2) Questionnaire
	3) Semi-structured interviews
		1) Descriptive Statistics
		2) Open Coding

2) Are there differences in relation to academic libraries' reported compliance with the static and non-static (audiovisual) media digitization guidelines?	1) Questionnaire	1) Statistical Analysis for Comparison (Paired Samples Test and Wilcoxon Signed Ranks Test [two-tailed])
3) What are the challenges that academic libraries face in	1) Questionnaire 2) Semi-structured interviews	1) Descriptive Statics 2) Open Coding

digitizing static and non-static (audiovisual) media?		
4) Are there differences in the challenges that academic libraries face in digitizing static and non-static (audiovisual) media?	1) Questionnaire	1) Statistical Analysis for Comparison (Wilcoxon Signed Ranks Test [two-tailed])
5) What are the solutions that academic libraries apply or suggest how to overcome these challenges?	1) Questionnaire 2) Semi-structured interviews	1) Descriptive Statics 2) Open Coding

This doctoral dissertation went through multiple stages of data collection and analysis. Document analysis of digitization guidelines was the first step in the sequence of data collection and analysis. This was followed by distributing the electronic questionnaire and then analyzing the collected data in order to define the questions of the semi-structured interviews. Diversity of states, universities, and digitization guidelines were all among the considerations in selecting interviewees. Once selections were made, semi-structured interviews were conducted and recorded to facilitate transcribing them via computer software *Nuance Dragon NaturallySpeaking Premium* (Version 13), prior to analyzing the interviews. Different computer software programs were used to assist in data analysis for the quantitative and qualitative phases of this study. Both IBM SPSS Statistics 25 and NVivo 11 were used to analyze data collected in the electronic questionnaire, whereas NVivo 11 was used to analyze the data collected during the semi-structured interviews. Figure 3.3 represents this sequence of data collection and analysis techniques:
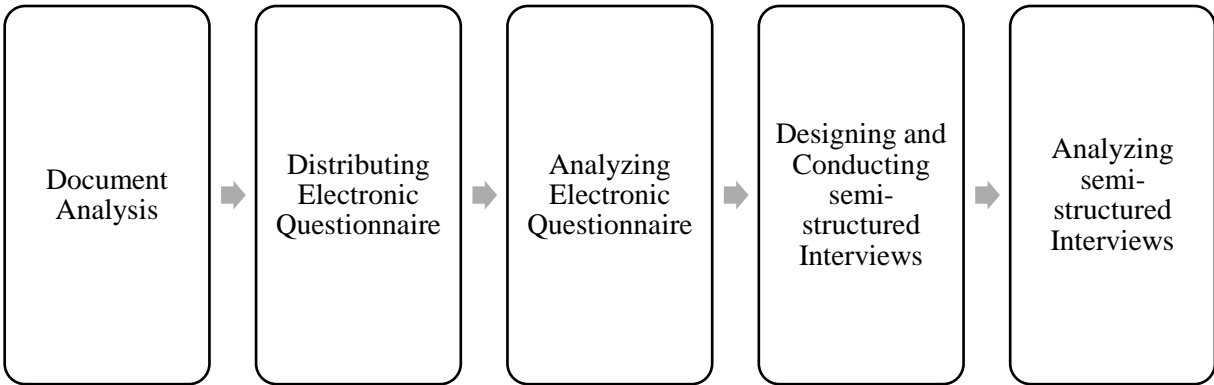
Figure 3.3 Sequence of data collection and analysis techniques

3.4.1. Quantitative data analysis

There are several statistical techniques for analyzing numeric data such as: descriptive versus inferential statistics, and parametric versus nonparametric statistics (Teddlie & Tashakkori, 2009). Quantitative data analysis starts from descriptive to inferential, whereas more refined results can be achieved by following the various steps provided using inferential analysis (Creswell & Clark, 2011). Generating interpretable tables and graphs, as well as a group's representation or scores are examples of summarizing numeric data using descriptive statistical methods (Teddlie & Tashakkori, 2009). Therefore, Qualtrics Survey Software helped in providing descriptive statistics for the quantitative data collected by the electronic questionnaire. For instance, Question 11 asked "Does your university have a DIGITIZATION PLAN?" so the responses for each choice were calculated as percentages.

The majority of the collected quantitative data for the second and fourth research questions do not have normal distribution based on the normality tests conducted using IBM

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SPSS Statistics 25 (See Appendix G). The Paired Samples Test was applied only on specific sets of quantitative data related to the second research question, because they had normal distribution. Vaughan (2001) mentioned that the equivalent nonparametric test to the paired t test is the Wilcoxon signed ranks test, and it can be used when the frequency distributions are very skewed. Hence, statistical analysis for comparison (i.e., Wilcoxon Signed Ranks Test [two-tailed]) was applied for the two research questions of this doctoral dissertation to compare between static and non-static (audiovisual) media. The Wilcoxon Signed Ranks Test was used, because of the interest in analyzing paired data collected from only one sample. The same subject answered questions of static and non-static (audiovisual) media in the electronic questionnaire. A two-tailed test was used, because at this moment there is no information that indicates which sample (i.e., static and non-static [audiovisual] media) is better than the other.

Applying statistical analysis for the second research question helped in comparing the reported compliance level with the static media digitization guidelines to the compliance level with the non-static (audiovisual) media digitization guidelines. For instance, Question 19 in the electronic questionnaire (see Appendix C) deals with compliance levels with static media digitization guidelines, whereas Question 34 deals with compliance levels with non-static (audiovisual) media digitization guidelines. These two questions were designed based on a 6-point Likert scale from 0% "Not At All Complied" to 100% "Strongly Complied." Then, the subject rated his/her compliance level on a percentage scale from 0% to 100% for each listed digitization guideline.

Hence, the Paired Samples Test and Wilcoxon Signed Ranks Test (two-tailed) were applied by using IBM SPSS Statistics 25 on parallel questions between the second and third major sections of the electronic questionnaire. Comparisons were conducted between the levels

of compliance, availability, and the usefulness of digitization guidelines for static media (i.e., questions 19, 22 and 24) versus non-static (audiovisual) media (i.e., questions 34, 37 and 39) that were mentioned in the electronic questionnaire. Similarly, comparisons were conducted to compare the agreement levels of the challenges encountered in digitization of static media (i.e., Question 26) and those of non-static (audiovisual) media (i.e., Question 41) in the electronic questionnaire. This statistical analysis helped in rejecting or failing to reject the 15 hypotheses (Section 1.3.) with a significance level at 0.05.

Because the electronic questionnaire has 13 open-ended questions, they were handled differently. A qualitative analysis by using open-coding was applied for these open-ended questions. For instance, one of the open-ended questions in the electronic questionnaire (i.e., Question 27) asked about the top five challenges that subjects' universities faced in digitizing static media. Hence, anonymous examples were mentioned in the results (e.g., S1 mentioned this issue as a digitization challenge encountered digitizing static media). Also, similar challenges were grouped together to calculate their frequency. The following section (Section 3.4.2.) provides a detailed explanation for the qualitative data analysis applied for this doctoral dissertation.

3.4.2. Qualitative data analysis

Analyzing qualitative data is eclectic (Teddlie & Tashakkori, 2009). Also, Flick (2014) recommended recording and transcribing interviews to create a database for the analysis procedure. Data coding, creating small units from the text via division, conducting label assignment to the created units, then grouping the codes based on themes is achieved during

analyzing the qualitative data (Creswell & Clark, 2011). Generating emergent themes which were evolved by examining particular pieces of information is adopted by the majority of qualitative analytic techniques (Teddlie & Tashakkori, 2009). Furthermore, Creswell (2013) described open coding as "coding the data for its major categories of information" (p. 86). Regarding open coding, Flick (2014) indicated that expressions can be classified by the meaning's units, which facilitate attaching both annotations and concepts. However, theoretical saturation means that coding ends once no more theoretical insights are newly discovered (Flick, 2014). Therefore, saturation was used during the open coding analysis in order to avoid information overload.

The questions of the semi-structured interviews were defined after analyzing the quantitative data. These questions were open-ended and designed to gather more in-depth data from the interviewees. Semi-structured interviews were conducted either online or over the telephone, based on the interviewee's preference. Only one semi-structured interview was conducted online via a specialized platform (i.e., Skype), whereas nine interviews were conducted over the telephone. The collected qualitative data were recorded and transcribed, then analyzed based on the emerging themes. Open coding was performed for the transcribed interviews to identify emergent themes and create the corresponding categories.

NVivo 11 computer software was used to analyze the collected qualitative data from the semi-structured interviews. After conducting and transcribing the ten semi-structured interviews, data were entered into NVivo 11 to start the analysis process. Categories were then created based off the interviewees' responses, in addition, labels were assigned to the generated categories. Open coding has a positive impact on handling qualitative data, because it organizes the data into categories. This organization facilitates ease in identifying main themes; moreover, classifying

responses into small units through open coding makes qualitative analysis easier and more accurate.

Semi-structured interviews used open-ended questions to collect data (e.g., asking about the suggested solutions for digitizing static media based on the interviewees' perspectives) to facilitate an open coding process during data analysis. For example, digitization challenges were analyzed by applying open coding (Sections 4.3.1 and 4.3.2.). Similarly, both applied and suggested solutions were analyzed using the same coding technique (Sections 4.5.1. and 4.5.2.).

However, a single statement might be coded under more than a single theme during data analysis, because of its multiple meanings. For instance, S118 said "Grants for digitization training" as a suggested solution to overcome the challenges facing digitization of static media, so this statement was coded under two themes of *Suggested Solutions* (i.e., *Funding* and *Staff Awareness and Skills*). Moreover, some general statements found in the qualitative data were coded as static and non-static (audiovisual) media, because they did not directly refer to a specific type of media. Tables 3.8-3.10 show the open coding analysis that is presented in the fourth chapter of this doctoral dissertation.

Table 3.8
Challenges That Academic Librarians Face in Digitizing Static Media

Types of Challenges	Definitions

Table 3.9
Solutions That Academic Librarians Applied to Static Media Digitization

Types of Applied Solutions	Definitions

Table 3.10
Solutions That Academic Librarians Suggested to Static Media Digitization

Types of Suggested Solutions	Definitions

3.5. Validity and Reliability

3.5.1. Internal and external validity

Gravetter and Forzano (2012) defined external validity as "the extent to which we can generalize the results of a research study to people, settings, times, measures, and characteristics other than those used in that study" (p. 168). Determining the extent that allows applying the results by the investigator to a larger population refers to the external validity (Creswell & Clark, 2011). There are strategies and procedures to assess qualitative validity such as member-checking, and triangulation of data from many resources (Creswell & Clark, 2011). Similarly, Creswell (2013) considered triangulation as one of the validation strategies, which aims on corroborating evidence from variant sources in order to explain a theme. (Greene, Caracelli, &

Graham, 1989) said, regarding the purpose of applying triangulation, that it "seeks convergence, corroboration, correspondence of results from the different methods" (p. 259).

Therefore, subjects involved in digitization from different universities all over the United States were included in this doctoral dissertation. Having subjects from different states helped in generalizing the findings. All subjects from these 222 universities were included without applying any limitations to the subjects' age, gender, years of experience, or academic status. Furthermore, asking a colleague to check the results of two interviews helped in enhancing the qualitative validity. Applying triangulation of data collection methods by using document analysis, an electronic questionnaire, and semi-structured interviews helped to increase the qualitative validity as well.

On the other hand, Gravetter and Forzano (2012) said regarding internal validity "A research study has **internal validity** if it produces a single, unambiguous explanation for the relationship between two variables" (p. 170, emphasis original). The investigator's ability to determine the extent to which a cause and effect relationship between the variables can be determined represents internal validity (Creswell & Clark, 2011). This doctoral dissertation has one independent variable with two levels, which are static and non-static (audiovisual) media. On the contrary, the levels of compliance, availability, usefulness, and challenges represent the dependent variables. The Likert scale in the electronic questionnaire is adopted to measure the dependent variables (i.e., levels of compliance [questions 19 and 34], availability [questions 22 and 37], usefulness [questions 24 and 39], and challenges [questions 26 and 41]). Adopting the Likert scale helped in providing a more precise method to measure the participants' perspectives toward these aspects (i.e., levels of compliance, availability, usefulness, and challenges).

Additionally, triangulation in data collection helped in improving internal validity by asking the same question using different tools. For instance, challenges facing digitization were investigated by using the electronic questionnaire and semi-structured interviews. In other words, there were open-ended and closed-ended questions that asked about digitization challenges in the electronic questionnaire; in addition, the semi-structured interviews also contained an open-ended question about digitization challenges.

3.5.2. Reliability

Having consistent and stable scores over time received from the participants represents quantitative reliability (Creswell & Clark, 2011). Gravetter and Forzano (2012) defined reliability of measurement this way: "The **reliability** of a measurement procedure is the stability or consistency of the measurement. If the same individuals are measured under the same conditions, a reliable measurement procedure produces identical (or nearly identical) measurements" (p. 85, emphasis original). Nonetheless, error can cause inconsistency in a measurement, while participant changes, environmental changes, and observer error represent the most common sources of error (Gravetter & Forzano, 2012). Thus, the employment of a procedure called inter-coder agreement in qualitative research, which consists of hiring several individuals to code a particular transcript and determine whether they reached the same codes and themes or not by comparing their work (Creswell & Clark, 2011).

Regarding quantitative reliability, all the doctoral universities with highest and higher research activity mentioned by The Carnegie Classification of Institutions of Higher Education (2015 classification) were included in this doctoral dissertation. In an effort to ensure qualitative

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reliability, a colleague was asked to check the coding of two interviews and calculate the level of agreement. Since 10 subjects were recruited for the qualitative phase, two interviews were selected to check the inter-coder reliability. The total number of statements found in the coding of the two interviews was 128. The researcher and colleague both agreed on the coding of 120 statements. Disagreement occurred on only eight statements out of the total number (i.e., 128 statements). Holsti's method (C.R. = $2M/N_1 + N_2$) was used to measure the inter-coder reliability for the two interviews. This means the inter-coder reliability is 93.75%, is a satisfactory percentage.

3.6. Chapter Summary

This chapter explained the applied methodology for investigating digitization best practices adopted by academic libraries in the United States. This doctoral study adopted mixed methods research approach, specifically an explanatory design. The sample for this doctoral dissertation is doctoral universities with highest and higher research activity based on the 2015 classifications issued by The Carnegie Classification of Institutions of Higher Education.

Three data collection techniques were applied to collect both quantitative and qualitative data, respectively. Document analysis of five digitization guidelines was performed to identify official technical specifications and file formats. Then, an electronic questionnaire was distributed to an academic library at each university of the defined sample. After that, purposive sampling was applied in order to select 10 subjects for semi-structured interviews, chosen based on an effort to gather information from diversity of states, universities, and digitization guidelines.

Data analysis was applied in two separate steps during this doctoral dissertation. Quantitative data collected by the electronic questionnaire were analyzed at the first step of data analysis. Then, qualitative data collected by the semi-structured interviews were analyzed at the second step of analysis. Moreover, many techniques were adopted to increase the validity of this doctoral dissertation, such as triangulation and including all the subjects from the 222 universities without applying any limitations. Inter-coder agreement for two interviews was applied through using Holsti's method.

Chapter 4 Results

4.1. Adopted digitization guidelines and compliance

4.1.1.   Data from Guidelines (Document Analysis)

Digitization best practices for digitizing analog media, both static and non-static (audiovisual), were created by many associations, organizations, libraries, universities, consortia, and archives. Only guidelines developed by institutions located in the United States were selected, because this doctoral dissertation focuses on academic libraries located in United States. Special attention was dedicated to the recommended technical specifications and file formats. However, other topics (e.g., quality control and selection of materials) detailed in these guidelines were not covered in this doctoral dissertation. More information is available on the original sources of these digitization guidelines. Consequently, a total of five digitization guidelines were analyzed during document analysis. These discussed either static and non-static (audiovisual) media or one of two types. The following sections (Sections 4.1.1.1. and 4.1.1.2.) consist of brief analysis for these guidelines based on their digitization technical specifications.

4.1.1.1.   *Static Media*

Five digitization guidelines were examined during the document analysis for this doctoral dissertation, whereas all of them discussed static media digitization. Three documents from CARLI were grouped together during document analysis. Table 4.1 shows the frequency of digitization technical specifications among these seven digitization documents:

Table 4.1

A Brief Matrix of Digitization Technical Specifications Found in the Examined Digitization Guidelines for Static Media

Digitization Guidelines		ALCTS: Association for Library Collections and Technical Services (*Minimum digitization capture recommendations*)	BCR's CDP Digital Imaging Best Practices Working Group (*BCR's CDP digital imaging best practices*)	CARLI: Consortium of Academic and Research Libraries in Illinois (*Guidelines for the creation of digital collections: Digitization Best Practices for Images*) / (*Guidelines for the creation of digital collections: Digitization Best Practices for Text*) / (*Guidelines for the creation of digital collections: Digitization Best Practices for Three-Dimensional Objects*)	FADGI: Federal Agencies Digital Guidelines Initiative (*Technical guidelines for digitizing cultural heritage materials: Creation of raster image files*)	NARA: National Archives and Records Administration (*NARA Technical guidelines for digitizing archival materials for electronic access: Creation of production master files – raster images*)
	Source					
	Citation	(Bogus, Blood, Dale, Leech, & Mathews, 2013)	BCR's CDP Digital Imaging Best Practices Working Group (2008)	CARLI (2017b) / CARLI (2017d) / CARLI (2017e)	FADGI (2016)	Puglia, Reed, & Rhodes, 2004).
Digitization Technical Specifications	Bit Depth	✔	✔	✔	✔	✔
	Color Mode	✔	✔	✔	✔	✔
	Color Space		✔	✔	✔	✔
	Compression		✔	✔	✔	✔
	File Format / Extensions (Access/Derivative Files)		✔	✔	✔	✔
	File Format / Extensions (Master/Preservation Files)		✔	✔	✔	✔
	Optical Character Recognition (OCR)	✔	✔	✔	✔	
	Pixel Array / Spatial Dimensions	✔	✔	✔	✔	✔
	Ratio		✔		✔	✔
	Resolution	✔	✔	✔	✔	✔

The frequency of each digitization technical specification among the digitization guidelines in Table 4.1 was calculated on a percentage scale. For instance, if a specific digitization technical specification (e.g., resolution) was discussed by all five digitization guidelines, this technical specification (i.e., resolution) received 100%, because of its frequency of occurrence in all the examined digitization guidelines. Table 4.2 shows the percentages of the frequency of the digitization technical specifications found in selected digitization guidelines:

Table 4.2

Percentage of Frequency of each Digitization Technical Specification Discussed by the Examined Digitization Guidelines for Static Media (N=5)

Digitization Technical Specification	Percentage
Bit Depth	100%
Color Mode	100%
Color Space	80%
Compression	80%
File Format / Extensions (Access/Derivative Files)	80%
File Format / Extensions (Master/Preservation Files)	80%
Optical Character Recognition (OCR)	80%
Pixel Array / Spatial Dimensions	100%
Ratio	60%
Resolution	100%

According to Table 4.1, some digitization technical specifications occurred more frequently than others. Bit depth, color mode, and resolution were mentioned in all five digitization guidelines examined for this study. Also, both file format / extensions (access/derivative files) and file format / extensions (master/preservation files) occurred among four digitization guidelines. This finding supports statements mentioned by Zhou (2010) and Xie and Matusiak (2016) in the third paragraph of the section entitled *Digitization of static media compliance* (Section 2.1.6.) of this doctoral dissertation. Zhou (2010) stated that resolution, color mode, and file format affect the digitized document's quality and file size, whereas Xie and Matusiak (2016) mentioned that resolution, color mode, and bit depth directly affect the quality of digital master files.

4.1.1.2. *Non-static (Audiovisual) Media*

The document analysis for non-static (audiovisual) media conducted for this doctoral dissertation found that only two digitization guidelines from the selected sample discussed audio materials, and digitization guidelines about video and/or moving images materials were mentioned by two guidelines. Tables 4.3 and 4.4 show the frequency of technical specifications among these digitization guidelines for audio (Table 4.3), then for video and moving images (Table 4.4). It is important to clarify that details of the accompanying audio were excluded from Table 4.4, and that CARLI (2017c) discusses only moving images.

Table 4.3
A Brief Matrix of Digitization Technical Specifications Found on the Examined Digitization Guidelines for Audio

<table>
<tr>
<td rowspan="2" colspan="2" style="text-align:center">Digitization Guideline</td>
<td style="text-align:center">Source</td>
<td style="text-align:center">ALCTS: Association for Library Collections and Technical Services (<i>Minimum digitization capture recommendations</i>)</td>
<td style="text-align:center">CARLI: Consortium of Academic and Research Libraries in Illinois (<i>Guidelines for the creation of digital collections: Digitization best practices for audio</i>)</td>
</tr>
<tr>
<td style="text-align:center">Citation</td>
<td style="text-align:center">(Bogus, Blood, Dale, Leech, & Mathews, 2013)</td>
<td style="text-align:center">CARLI (2017a)</td>
</tr>
<tr>
<td rowspan="7" style="text-align:center">Digitization Technical Specifications</td>
<td>Bit Depth</td>
<td style="text-align:center">✓</td>
<td style="text-align:center">✓</td>
</tr>
<tr>
<td>Bit Rate</td>
<td></td>
<td style="text-align:center">✓</td>
</tr>
<tr>
<td>Channel</td>
<td></td>
<td style="text-align:center">✓</td>
</tr>
<tr>
<td>Compression</td>
<td></td>
<td style="text-align:center">✓</td>
</tr>
<tr>
<td>File Format / Extensions (Access/Presentation/Derivative Files)</td>
<td></td>
<td style="text-align:center">✓</td>
</tr>
<tr>
<td>File Format / Extensions (Master/Preservation/Archival Files)</td>
<td></td>
<td style="text-align:center">✓</td>
</tr>
<tr>
<td>Sample Rate</td>
<td style="text-align:center">✓</td>
<td style="text-align:center">✓</td>
</tr>
</table>

Table 4.4

A Brief Matrix of Digitization Technical Specifications Found on the Examined Digitization Guidelines for Video

Digitization Guideline		ALCTS: Association for Library Collections and Technical Services (*Minimum digitization capture recommendations*)	CARLI: Consortium of Academic and Research Libraries in Illinois (*Guidelines for the creation of digital collections: Digitization best practices for moving images*)
	Citation	(Bogus, Blood, Dale, Leech, & Mathews, 2013)	CARLI (2017c)
Digitization Technical Specifications	Aspect Ratio		✓
	Compression	✓	✓
	Data Rate (Bit Rate)		✓
	Field Rate		✓
	File Formats / Extensions (Access/Derivative Files)		✓
	File Formats / Extensions (Master/Preservation/Archival Files)		✓
	Frame Rate		✓
	Resolution	✓	✓
	Sample Size (Bit Depth)	✓	✓
	Sampling Scheme		✓
	Scanning		✓
	Video Standard		

Tables 4.3 and 4.4 presented a brief matrix for audio and another one for video/moving images. Among the selected digitization guidelines, only two discussed audio (Table 4.3). The quantity of technical specifications for digitizing audio varied between these two guidelines. Regarding video, only two digitization guidelines discussed digitizing video/moving images materials (Table 4.4). Similarly, the amount of the discussed digitization technical specifications for video/moving images materials in both guidelines varied as well.

4.1.1.3. Document Analysis Challenges

Although document analysis is a powerful tool for collecting information, it has some challenges. Within the context of this doctoral dissertation, few challenges were experienced. The digitization guidelines examined for this doctoral dissertation varied in content, structure, date, length, detail, and many other aspects. For instance, some discussed digitizing both static and non-static (audiovisual) media, whereas others discussed only one of them. Also, some of these guidelines differed in the discussed pre-digitization and post-digitization activities along with the technical specifications.

Furthermore, the structure of the document's contents differed among the selected digitization guidelines. Therefore, facing a variation in the contents and structures of these digitization guidelines represented a challenge and weakness at the same time. Consequently, determining specific elements for document analysis was an appropriate solution to effectively address these differences. Technical specifications and file formats were, therefore, selected as the elements of document analysis for this dissertation.

Another challenge of document analysis within the context of this doctoral dissertation was the date of the selected documents. Some digitization guidelines had recent publication or revision dates; other digitization guidelines may have had earlier dates. This concern raises the question of whether or not there exists a newer version of the digitization guidelines in question. Therefore, careful attention was paid, during performing online searches, to locate the newest available version in an attempt to overcome this challenge.

4.1.2. Data from Practitioners (Electronic Questionnaire and Interviews)

The electronic questionnaire asked questions regarding subjects' awareness of digitization, such as training programs taken, the university's digitization plan, as well as identifying difficult and prioritized items selected for digitization. A total of 46 subjects (67.65%) indicated that they had taken a training program on digitization, 21 subjects (30.88%) indicated that they had not, and one subject (1.47%) did not respond to this question. Subjects who indicated that they had taken a training program on digitization were able to choose the nature of such training programs. Table 4.5 shows the nature of these training programs on digitization:

Table 4.5
The Nature of Taken Training Programs

Training Program	Count
Conferences	35
Lectures	19
Onsite courses	15
Online learning	27
Seminars	14
Training sessions	23
Workshops	35
Other. Please, specify	5
Total	173

Regarding the eighth option "*Other. Please, specify,*" different answers were given by a few subjects. These included "Webinars" (S62), "Internships/Apprenticeships" (S224), "MLIS coursework" (S150), and "SAA's DAS and A&E certification" (S118).

Regarding the university's digitization plan, 37 subjects (54.41%) indicated that their universities have digitization plans, 19 subjects (27.94%) reported that their universities do not have digitization plans, seven subjects (10.29%) indicated that they do not know, and five subjects (7.35%) did not answer this question. Subjects who indicated that their universities have a digitization plan were able to upload their universities' digitization plans into the Qualtrics survey. A total of 12 files were uploaded. After briefly analyzing these 12 files, it was noted that the files differed in length, structure, contents, and level of detail. For instance, differences were noticed in the lengths (number of pages) of these uploaded digitization plans, which leading to variations in levels of detail regarding the discussed topics. Also, the contents of the uploaded digitization plans lacked consistency among most of the uploaded files. These brief findings indicated that lack of a unified design among these 12 digitization plans.

Questions number 13 and 14 in the electronic questionnaire asked about the types of material selected for digitization at the subjects' universities. Two themes, priority and difficulty, were addressed through these two questions. Subjects were asked to select the three highest priority items chosen for digitization, and were asked again to select the three most difficult items chosen for digitization. Reported results in Table 4.6 show the following order of the three highest prioritized items chosen for digitization as being: 1) photographs, 2) manuscripts, and 3) rare books. On the other hand, the reported results in Table 4.7 show the order of the three most difficult items chosen for digitization as being: 1) video, 2) other oversized documents, and 3) three-dimensional objects. Tables 4.6 and 4.7 show descriptive analysis for these two questions:

Table 4.6

The Three Highest Prioritized Items Chosen for Digitization

Items	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
Non-rare books	1.00	3.00	2	0.67	0.44	9
Rare books	1.00	3.00	2.17	0.85	0.72	24
Manuscripts	1.00	3.00	1.59	0.73	0.54	41
Microform	1.00	3.00	2	0.82	0.67	3
Maps	1.00	3.00	2.42	0.64	0.41	12
Other oversized documents	2.00	2.00	2	0	0	2
Posters	3.00	3.00	3	0	0	2
Photographs	1.00	3.00	1.78	0.75	0.56	46
Slides	2.00	3.00	2.75	0.43	0.19	4
Three-dimensional objects	3.00	3.00	3	0	0	1
Audio	1.00	3.00	2.24	0.73	0.53	17
Film	2.00	3.00	2.43	0.49	0.24	7
Video	1.00	3.00	2.44	0.79	0.62	16
Other materials	1.00	3.00	1.75	0.97	0.94	8

Table 4.7

The Three Most Difficult Items Chosen for Digitization

Items	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
Non-rare books	1.00	2.00	1.67	0.47	0.22	3
Rare books	1.00	3.00	1.87	0.8	0.64	23
Manuscripts	1.00	3.00	2.17	0.69	0.47	6
Microform	1.00	3.00	1.88	0.78	0.61	8
Maps	1.00	3.00	2	0.96	0.92	13
Other oversized documents	1.00	3.00	2.13	0.67	0.44	24
Posters	2.00	3.00	2.33	0.47	0.22	3
Photographs	3.00	3.00	3	0	0	3
Slides	0	0	0	0	0	0
Three-dimensional objects	1.00	3.00	2	0.91	0.83	24
Audio	1.00	3.00	2.27	0.81	0.65	22
Film	1.00	3.00	1.77	0.79	0.63	22
Video	1.00	3.00	1.88	0.77	0.59	33
Other materials	1.00	3.00	2	1	1	2

4.1.2.1. Static Media

A total of 64 subjects (94.12%) in the electronic questionnaire indicated that their university digitizes static media (e.g., manuscripts, books, newspapers, maps, posters, and photographs), whereas four subjects (5.88%) did not answer this question. Regarding the strategy for the

digitization process of static media at subjects' universities, 37 subjects (54.41%) indicated that

only unique materials are selected for digitization, 25 subjects (36.76%) indicated that all the

materials are subject to the digitization process, and six subjects (8.82%) did not respond to this

question.

Subjects were asked about guidelines adopted by their universities for digitizing static media.

Table 4.8 shows the adopted digitization guidelines based on the responses given in the

electronic questionnaire:

Table 4.8
Adopted Guidelines by Subjects' Universities for Digitizing Static Media

Digitization Guidelines	Count
ALCTS: Association for Library Collections & Technical Services	4
BCR's CDP Digital Imaging Best Practices Working Group	6
FADGI: Federal Agencies Digital Guidelines Initiative. Please, specify the level of imaging (1, 2, 3, or 4 star)	28
IFLA: International Federation of Library Associations and Institutions	0
NARA: National Archives and Records Administration	13
Consortium/Consortia digitization guidelines	11
University's own customized digitization guidelines	43
Other digitization guidelines. Please, specify	6
Total	111

Regarding the level of imaging for FADGI in Table 4.8, many different responses were

collected from the subjects. Two responses indicated 1 star level of imaging, another two

responses indicated 2 star, nine responses indicated 3 star, two responses indicated 3-4 star, three

responses indicated 4 star, one response indicated 2-4 star, and three responses indicated

different answers such as "varies" (S47). Moreover, only six subjects reported different answers

for other digitization guidelines, such as "We may scan at higher resolutions when we know

there will likely be requests for enlargements of photographic prints and negatives" (S134),

"https://old.diglib.org/standards/bmarkfin.htm" (S5), and "Western States Digital Imaging Best

Practices and NEDCC Handbook" (S114).

The electronic questionnaire asked subjects regarding the technical specifications that

they follow as their minimum requirements in those digitization guidelines of static media. Table

4.9 shows the count of each technical specification:

Table 4.9
Technical Specifications Subjects Follow as Their Minimum Requirements in
the Digitization Guideline(s) of Static Media

Technical Specifications	Count
Bit Depth	45
Color Mode	38
Color Space	22
Compression	40
Access File Format	43
Master File Format	53
Optical Character Recognition (OCR)	36
Pixel Array	12
Ratio	18
Resolution	54
Spatial Dimension	14
Other. Please, specify	3
Total	378

Regarding other technical specifications in Table 4.9, three responses were collected,

such as "File naming protocols" (S105), and "unknown - outside my area of expertise" (S139).

Based on the selected digitization guideline(s) for digitizing static media in the electronic

questionnaire, subjects were asked to indicate their compliance level (*0% for Not At All*

Complied, whereas 100% for Completely Complied) regarding the use of digitization guidelines

of static media on a 6-point Likert scale. Table 4.10 shows a descriptive analysis for the collected

responses from the subjects:

Table 4.10
A Descriptive Analysis for Compliance Level Regarding the Adopted Digitization
Guidelines of Static Media

Digitization Guidelines	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
ALCTS: Association for Library Collections & Technical Services	1	6	2.92	1.98	3.91	24
BCR's CDP Digital Imaging Best Practices Working Group	1	6	3.36	2.08	4.31	25
FADGI: Federal Agencies Digital Guidelines Initiative	1	6	4.24	1.56	2.44	38
IFLA: International Federation of Library Associations and Institutions	1	6	2.83	1.95	3.80	23
NARA: National Archives and Records Administration	1	6	3.53	1.86	3.45	30
Consortium/Consortia digitization guidelines	1	6	3.74	1.99	3.97	27
University's own customized digitization guidelines	1	6	5.21	1.15	1.33	48
Other digitization guidelines. Please, specify	1	6	4.43	1.59	2.53	7

Three answers were given for the option "Other digitization guidelines. Please, specify" in Table 4.10, such as: "Department" (S105), and "in house" (S107).

Subjects were asked in the electronic questionnaire and semi-structured interviews to provide reasons for compliance with the selected guidelines for digitizing static media. After conducting open coding for the collected responses, Table 4.11 shows the types and definitions of the reasons for their compliance with the selected digitization guidelines:

Table 4.11
Reasons for Compliance with Guidelines for Digitizing Static Media

Types of Reasons	Definitions
Access and Preservation	Reasons of compliance that are related to user's reach to information and long-term storage considerations.
Consistency, Standardization, and Sustainability	Reasons of compliance that are related to the uniformity and stability considerations.
Funding	Reasons of compliance that are related to financial considerations.
Guidelines	Reasons of compliance that are related to the adopted digitization guidelines and standards.
Hardware	Reasons of compliance that are related to the digitization equipment considerations.
Physical Material	Reasons of compliance that are related to the tangible media containing information.
Planning and Workflow	Reasons of compliance that are related to the design and implementation of procedures in the digitization process.
Staff Awareness and Skills	Reasons of compliance that are related to staff knowledge and expertise.

The frequency of the type of reasons for compliance with selected digitization guidelines for static media in Table 4.11 were calculated as well for a better visualization. Figure 4.1 shows the frequency of these types of reasons:

Reasons for Compliance with the Adopted Digitization Guidelines for Digitizing Static Media
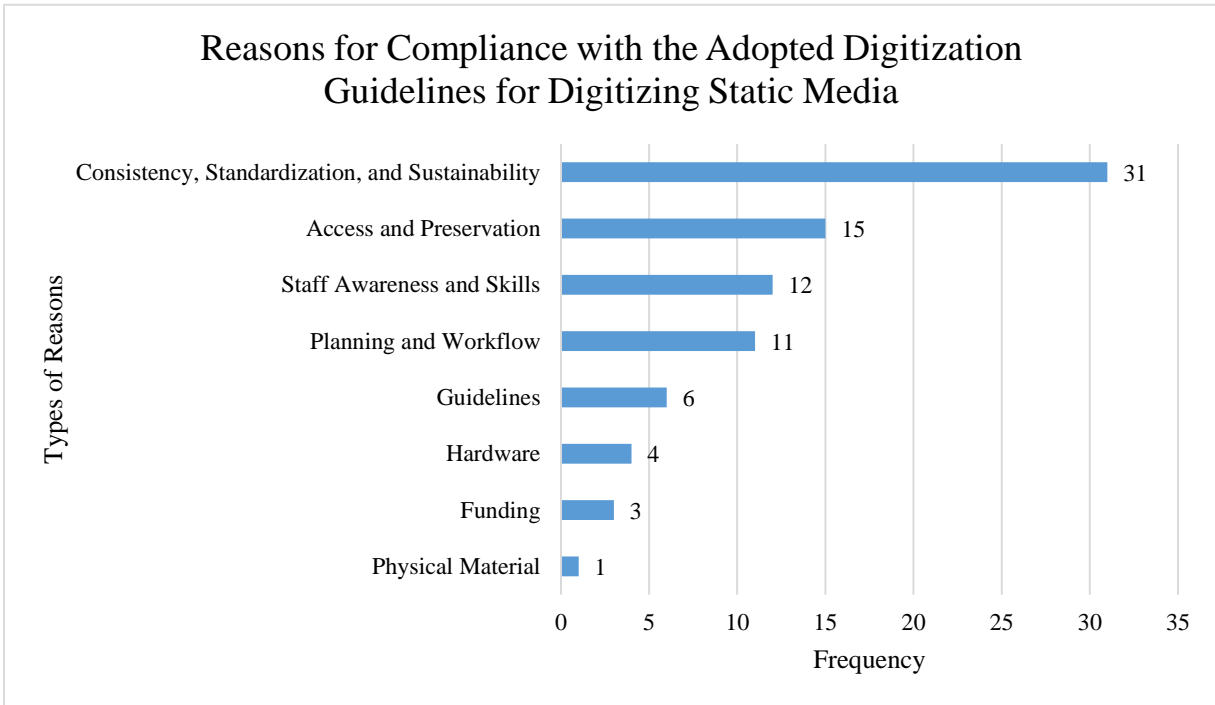
Figure 4.1 Frequency of the types of reasons reported by academic librarians for complying with adopted guidelines to digitize static media

Table 4.11 shows that different types of reasons were explored for the compliance of the academic librarians with the selected digitization guidelines. Subjects indicated their compliance with digitization guidelines for many reasons that may refer to a variety of considerations including access, preservation, hardware, funding … etc. The open coding analysis for the collected responses revealed eight categories of reasons for compliance within the context of static media. These categories are listed based on their frequency from highest to lowest, whereas the name of each category is italicized in the following paragraphs.

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Consistency, Standardization, and Sustainability is the first category of reasons explored. This category compiles responses refer to at least one of these three concepts. An example of a response coded in this category include: "To ensure a good digitization process and to promote consistency across the department" (S62), which refers to the goal of achieving uniformity within the digitization process. Another subject referred to the necessity of meeting other guidelines and standards by saying "The University's guidelines were compiled so as to meet requirements of consortial agencies, like HathiTrust, as well as archival best practices and national and international standards" (S77).

The second category of reasons is related to *Access and Preservation* considerations. Regarding preservation, S3 stated "Compliance is 100% for media designated for long-term preservation". Another subject said "Digital preservation is important we don't want to have to digitize materials again" (S174), which aims to avoid duplication of effort through not digitizing the same material more than once. On the other hand, access was emphasized as well by some responses, such as: "Most items we digitize for both preservation and access" (S208), which aims to ensure that the user can get to the digitized item.

A total of 12 responses were classified under the *Staff Awareness and Skills* category. These responses refer to aspects related to staff, such as their awareness, knowledge, and skills. For example, "I work primarily with the photo collection. As former professional photographer, I digitized to professional standards" (S131), which refers to the effect of the respondent's previous expertise in photography on digitizing photographs. Another subject provided more explanation related to the types of files incorporated with digitization projects by saying "I comply with them because I understand the importance of having separate master copies vs.

access copies, and because I am not a digitization expert, I let the experts determine the guidelines…" (S8).

A total of 11 responses were classified under the *Planning and Workflow* category, because they indicated that their compliance with the selected digitization guidelines is related to considerations regarding the design and implementation of the digitization process or to their institution. For example, "They are reasonable for what we hope to accomplish with our digitization program" (S45), which means that their compliance with such digitization guidelines is compatible with the goals of their digitization programs. Another subject reported exploring different best practices and implementing a particular method suitable for their institution by saying "After researching across many institutes best practices we came up with a methodology that works well for us and our collections" (Unspecified Subject Number).

Six responses referred to the adopted digitization guidelines and standards themselves; these responses were grouped into the *Guidelines* category. The two responses in this paragraph discuss two themes related to the digitization guidelines, which are popularity and flexibility. "Seems to be the most popular guidelines used" (S59), revealing that the popularity of the digitization guidelines could be a reason for complying with that particular set. Another example is "FADGI guidelines provide the most flexibility" (S225), indicating that the flexibility of the chosen digitization guidelines could be another reason for compliance.

Furthermore, four responses referred to digitization equipment as a reason for compliance. They were grouped into the *Hardware* category. An example of a response coded into this category is: "I find that the guidelines for static media are easy to follow and they're easy to achieve those recommendations and best practices based on the equipment that we have"

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(S111), which implies that the necessity of digitization guidelines be compatible with the current digitization equipment. A different subject said "We are also in the process of purchasing equipment that will meet FADGI compliancy" (S146), which shows that certain digitization guidelines might affect decisions related to purchasing equipment.

The *Funding* category includes responses pointing out that financial considerations played a role in compliance with the selected digitization guidelines. For instance, "Some of the guidelines like FADGI are requirements for implementing grants, we do have our own guidelines for digital collections that are non-grant related" (S118). This response clarified that more than one set of digitization guidelines can be adopted by the same institution, whereas financial considerations may play a role in implementing certain digitization guidelines.

Only one response indicted that *Physical Material* plays a role in complying with the adopted digitization guidelines. This category focuses on the physical material being digitized and its effect on complying with the digitization guidelines. "It depends on the kind of materials that we're digitizing.…we optimize our camera to make sure that the device level target passes the four-star rating…" (S150), which refers to the possibility of adjusting the adopted digitization guidelines based on the physical material selected for digitization.

On the other hand, subjects reported different types of reasons for not complying with selected digitization guidelines. After conducting open coding for the qualitative data, these reasons were categorized into 13 categories based on their types. Table 4.12 shows these categories and their definitions:

Table 4.12

Reasons for Non-Compliance with Guidelines for Digitizing Static Media

Types of Reasons	Definitions
Access and Preservation	Reasons of non-compliance that are related to user's reach to information and long-term storage considerations.
Copyright	Reasons of non-compliance that are related to copyright and intellectual property issues.
Funding	Reasons of non-compliance that are related to financial considerations.
Guidelines	Reasons of non-compliance that are related to the adopted digitization guidelines and standards.
Hardware	Reasons of non-compliance that are related to digitization equipment considerations.
Metadata	Reasons of non-compliance that are related to the descriptive data of a digital object.
Physical Material	Reasons of non-compliance that are related to the tangible media containing information.
Planning and Workflow	Reasons of non-compliance that are related to the design and implementation of procedures in the digitization process.
Software	Reasons of non-compliance that are related to computer programs.
Staff	
Staff Availability	Reasons of non-compliance that are related to staff presence.
Staff Awareness and Skills	Reasons of non-compliance that are related to staff knowledge and expertise.
Staff Time	Reasons of non-compliance that are related to the time devoted for digitizing static media.
Storage	Reasons of non-compliance that are related to considerations related to the capacity of the digital storage.

Furthermore, the frequency of each type of reason for non-compliance with the adopted digitization guidelines was measured. Figure 4.2 shows the frequency of each type of reasons:

Reasons for Not Complying with the Adopted Digitization Guidelines for Digitizing Static Media

Type of Reason	Frequency
Planning and Workflow	13
Hardware	12
Staff Awareness and Skills	9
Staff Time	7
Guidelines	7
Storage	5
Staff Availability	4
Software	4
Physical Material	4
Metadata	3
Funding	3
Access and Preservation	3
Copyright	1
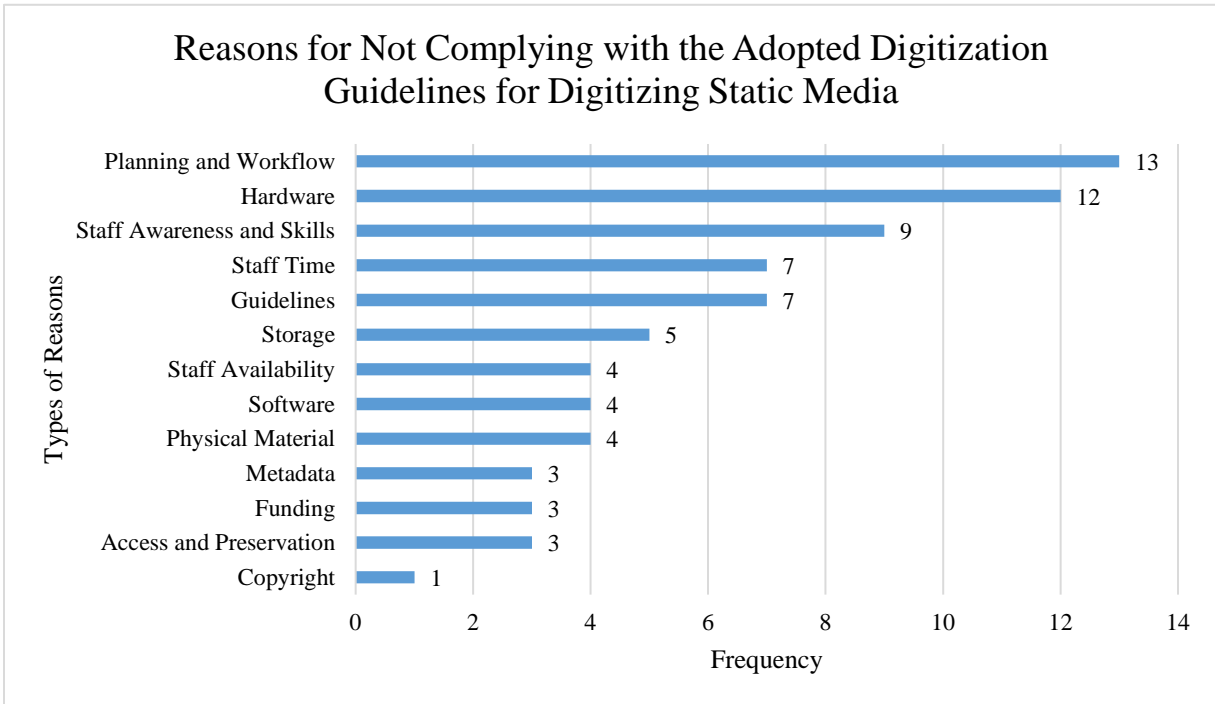
Figure 4.2 Frequency of the types of reasons reported by academic librarians for not complying with adopted guidelines to digitize static media

Table 4.12 listed the 13 types of reasons arranged alphabetically for not complying with selected digitization guidelines. Although these types are highly diverse, they applied a restriction on complying with the digitization guidelines as understood from the collected responses. The following paragraphs list these types of reasons based on their frequencies from the most to least, whereas the name of each group of these types is italicized.

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Responses related to *Planning and Workflow* resulted in this type of reasons being the top category according to frequency. These responses mentioned different aspects falling under planning and workflow of the digitization process. For example, "Initially we had some workflow difficulties that prevented us from complying 100%. Now we need to revisit the guidelines for additional improvements to our processes" (S192), which states that challenges occurring at any step of the digitization process may decrease compliance levels with adopted digitization guidelines. Another subject referred to following established institutional practices for fulfilling digitization projects, saying "Institutional priorities dictated before I joined have guided the digitization plan" (S224). However, the concept of compliance might not be an aim due to other factors such as the type of the digitization project, a conclusion derived from S117, who shared that, "Actually, I wouldn't say that we comply or attempt to comply with any particular guidelines. How we decide to digitize something depends on the purpose of the project (e.g. for preservation purposes, patron request, for a grant funded project, etc)."

Non-compliance with selected digitization guidelines might be affected by equipment. A total of 12 responses indicated *Hardware* considerations as a factor in non-compliance. For example, S54 answered "hardware limitations" as a direct response related to the restrictions of digitization equipment. "Non-compliance is more so the lack of equipment to meet all standards" (S132), referring to the absence of adequate digitization equipment compatible with the standards. S162 discussed outdated equipment in reference to another obstacle with digitization hardware, saying "Aging equipment and limited staff time to ensure compliance."

A total of 20 responses pointed up staff issues that led to not complying with digitization guidelines for static media. These responses were categorized into three groups (i.e., *staff availability*, *staff awareness and skills*, and *staff time*) for more precise analysis. *Staff Awareness*

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and Skills may lead to non-compliance as well. For instance, S45 said "I'm not aware of all of these sets of guidelines," indicating aspects related to staff knowledge and awareness. Seven responses indicated reasons related to *Staff Time*. For instance, "avoiding some of the more time and space consuming aspects of FADGI guidelines" (S186), which shows a relation between certain digitization guidelines and the time necessary to implement the digitization process. S58 provided another explanation regarding time factors in digitization, saying that "Extensive preparation of materials and devices as well as post-capture editing is time consuming and slows overall production," a statement indicating that activities such as preparation, adjusting equipment, and the post-digitization phase may require plenty of time.

A total of seven reasons for non-compliance referred to digitization *Guidelines*. These reasons provided many explanations for such avoidance to comply with the guidelines. For instance, "Local guidelines contradict other standards" (Unspecified Subject Number), which indicated conflicts between digitization guidelines. "The guidelines are largely duplicative. FADGI and NARA benchmarks work toward the same goals, with the same approaches, but with slightly variant emphases. ALCTS is too formulaic with regard to technical prescriptions" (S47) in a reference to the existence of information duplication between different set of guidelines. Another subject indicated the superiority of certain guidelines as compared to others, stating that "The university's guidelines meet or exceed most of the others listed" (S77).

Reasons related to *Storage* considerations were also explored via open coding. This category clarified how storage limitations may lead to avoidance in adhering to digitization guidelines. For instance, "Either we don't have the server space or we don't have the technical knowledge or it's just so time-consuming that we can't do it" (S107), referring to limitations in digital storage capabilities. S197 said "Our budget in terms of recording equipment and storage

does not allow us to scan at the currently-recommended resolutions. We are a few years behind in that regard" as a statement demonstrating the effect of financial issues on storage capabilities.

A total of four responses reported reasons related to *Staff Availability*. This category focuses on the presence of staff needed for the digitization process. For example, S117 said "…not really having someone devoted exclusively or even spending a lot of their time you know exploring these guidelines…," which explained the lack of having staff devoted to examining digitization guidelines. S58 provided an example of challenges related to employing students in digitization projects, saying "Use of students for digitization makes it difficult to teach and ensure compliance with complicated and exacting standards."

Responses related to *Software* considerations also identified as reasons for non-compliance with selected digitization guidelines. Subjects reported these reasons in different ways to indicate non-adherence to digitization guidelines. For example, "…we do give some allowance for imperfection and particularly with deskewing and correcting in the histogram in postprocessing and also cropping" (S168), which refers to the possibility of human errors occurring in post-digitization activities dealing with computer programs. S150 said "…we still use some software straightening which is for FADGI four-star for manuscript materials are not really supposed to do that…" to refer to some actions related to computer programs in digitization that were applied although they were not recommended in the adopted guidelines.

The selected *Physical Material* may result in not complying with the adopted digitization guidelines. A few respondents reported that the material itself affects adherence levels to digitization guidelines. For example, "Some projects or materials do not require the highest possible output or will not be saved for the long term" (S104), acknowledging that the condition

and type of material selected for digitization might affect adherence levels to adopted digitization guidelines. S225 said "There needs to be a variable approach to scanning based upon the material type, user expectations, and fragility" in a reference to the effect of the nature and condition of physical material on scanning decisions.

Responses referring to *Metadata* issues were found. These indicated that the metadata required for the digitization process is resulting in non-compliance with selected digitization guidelines. For example, "Occasionally, NARA asks for more metadata creation than is necessary for our Internet Archive and ContentDM scanning purposes" (S16), which emphasizes that creating additional metadata beyond the needed amount is a challenge. Another challenge related to metadata was also reported by S150, who said that "…with the FADGI guidelines for static media we don't at this point adopt their metadata practices which call for the embedding of some metadata in your images.…we felt like its not really efficient. And also maybe there would be some risks for, you know, embedded metadata is more vulnerable…."

Financial considerations still occur even for non-compliance with selected digitization guidelines. The *Funding* category has a total of three responses that were coded as financial considerations. For instance, "Our budget in terms of recording equipment and storage does not allow us to scan at the currently-recommended resolutions. We are a few years behind in that regard" (S197), which demonstrates how the effect of limitations in budget and financial resources may lead to non-compliance with adopted digitization guidelines. Similarly, S174 said "standards were developed when server space was at a premium. So we chose a balance between best practice and costs for a large volume of images" to explain how digitization costs may affect digitizing large collections.

Considerations related to *Access and Preservation* provided a restriction on such compliance with the digitization guidelines. A total of three responses were coded into this category. For example, "We place emphasis on access over preservation" (S225), which clarifies how institutions may prioritize one goal (i.e., access or preservation) over another. Another subject provided a similar response regarding prioritizing access over preservation by saying "This institution saves money on vendor costs by digitizing media in non-preservation formats that are designated for short-term access" (S3).

Copyright restrictions and limitations may affect the usage of material. Digitization decisions are also affected because of copyright considerations. Only one response regarding copyright restriction was provided as a reason for non-compliance. The response: "We may digitize at lower resolution if the digital images are meant for online exhibit only, and if we do not have the rights to the images" (S134), clarifies how copyright issues encountered during a digitization project may impact scanning decisions.

Based on the selected guideline(s) for digitizing static media, subjects were asked through the electronic questionnaire to indicate the availability level (*0% indicates Not At All Available, whereas 100% indicates Completely Available*) of needed information from the digitization guidelines of static media on a 6-point Likert scale. For this question, availability means that the needed digitization recommendation for digitizing static media is available in the digitization guidelines used. Table 4.13 shows a descriptive analysis of the availability levels based on the collected responses:

Table 4.13

A Descriptive Analysis for Availability Level Regarding Adopted Digitization Guidelines for Static Media

Digitization Guidelines	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
ALCTS: Association for Library Collections & Technical Services	1	6	2.94	2.15	4.64	17
BCR's CDP Digital Imaging Best Practices Working Group	1	6	3.00	2.03	4.12	16
FADGI: Federal Agencies Digital Guidelines Initiative	1	6	4.97	1.70	2.91	32
IFLA: International Federation of Library Associations and Institutions	1	6	2.81	2.13	4.53	16
NARA: National Archives and Records Administration	1	6	4.05	1.91	3.66	21
Consortium/Consortia digitization guidelines	1	6	4.00	2.05	4.20	20
University's own customized digitization guidelines	1	6	5.02	1.66	2.76	41
Other digitization guidelines. Please, specify	1	6	3.00	2.45	6.00	5

Regarding the option "Other digitization guidelines. Please, specify" Table 4.13, four answers were given by the subjects, such as: "in house" (S107), and "Department" (S105).

Availability reasons were also investigated for this research study. The electronic questionnaire contained a question asking subjects to provide the reasons that made them select the availability percentage rating for the selected digitization guidelines of static media. Also, in semi-structured interviews, interviewees were asked about availability reasons. Consequently, different responses were collected from subjects. These responses were grouped into four main categories: 1) *Guidelines*, 2) *Hardware*, 3) *Institution*, and 4) *Staff Awareness and skills*.

Open coding explored responses referring to reasons related to digitization *Guidelines*. Reasons in this category may discuss different aspects of these guidelines, such as: accessibility to guidelines, alternative guidelines, comprehensiveness of guidelines, difficulty or simplicity of guidelines, and currency of the information. The following quotes are examples of the responses coded into this category. For example, "I have printed documentation for the ALCTS guidelines, FADGI guidelines, and our custom implementation guide, which are all available to all of my employees" (S53), illustrating an example of accessibility to digitization guidelines. Also, Unspecified Subject Number said "Because it is available online and is well organized with sections containing scanning recommendations for various media," implying the comprehensiveness of the guidelines. An example for a response regarding the currency of the guidelines is when S169 said "Many recommendations on these guidelines are outdated and simply do not reflect realities of practice. They are used to inform but not as a rule to comply to."

Regarding availability reasons related to *Hardware*, only one response was found. A subject said "It is readily available. It is easy to use, easy to achieve or follow those guidelines based on the equipment that we have" (S111), which shows that the needed guidelines are available and compatible with their current equipment. However, a total of 14 responses addressed reasons related to the *Institution* itself. For instance, "Our university doesn't have guidelines but I make them for my projects" (S105) in reference to the absence of digitization guidelines at a certain institution. Another example of this category was mentioned by S8, who said that "The guidelines were passed down to me from my predecessor, and I have adapted them somewhat, but they have been available to me from day 1. They are not, however, available publicly," confirming that these guidelines are only available to the staff of a particular institution. Finally, *Staff Awareness and Skills* is the last category found. For instance, "Lack of

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awareness of the 'not available' guidelines" (Unspecified Subject Number), which refers to the

lack of knowledge regarding some guidelines.

Based on the selected digitization guideline(s) by subjects in the electronic questionnaire

for digitizing static media, respondents were asked to select the usefulness level (*0% indicates*

Not At All Useful, whereas 100% indicates Completely Useful) regarding digitization guidelines

of static media used on a 6-point Likert scale. Table 4.14 shows a descriptive analysis of the

collected responses:

Table 4.14
A Descriptive Analysis for the Usefulness Level Regarding Adopted Digitization Guidelines for Static Media

Digitization Guidelines	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
ALCTS: Association for Library Collections & Technical Services	1	6	3.43	1.84	3.39	14
BCR's CDP Digital Imaging Best Practices Working Group	1	6	3.80	1.83	3.36	15
FADGI: Federal Agencies Digital Guidelines Initiative	1	6	5.13	1.36	1.85	30
IFLA: International Federation of Library Associations and Institutions	1	6	3.86	1.92	3.69	14
NARA: National Archives and Records Administration	1	6	4.43	1.68	2.82	21
Consortium/Consortia digitization guidelines	1	6	4.24	1.70	2.89	17
University's own customized digitization guidelines	1	6	5.38	1.17	1.37	37
Other digitization guidelines. Please, specify	1	5	3.00	1.63	2.67	3

Only two responses were given for the option "Other digitization guidelines. Please, specify" Table 4.14, these were: "Department" (S105), and "unknown - outside my area of expertise" (S139).

Subjects provided reasons for the percentage rating of usefulness assigned to the selected digitization guidelines. Also, semi-structured interviews collected qualitative data regarding the usefulness reasons. Data analysis for the collected responses explored ten categories of reasons related to the usefulness of the selected digitization guidelines for digitizing static media. These categories are: 1) *Access and Preservation*, 2) *Funding*, 3) *Guidelines*, 4) *Hardware*, 5) *Institution*, 6) *Metadata*, 7) *Physical Material*, 8) *Physical Space*, 9) *Staff Awareness and Skill*, and 10) *Storage*. The following paragraphs are organized alphabetically, and the title of each category is italicized.

The first category is *Access and Preservation* reasons. This category consists of one response only. S3 said "The contortial guidelines are usually more rigorous and provide the best-practices guidelines necessary for long-term preservation and access," which shows how the usefulness of guidelines can play a role in ensuring future access and preservation.

The second category is about reasons related to *Funding*. Only one response was coded into this category. The respondent stated: "I think the information is available, but at times I don't find it useful because we have resource limitations, money and space" (S107) to explain how financial issues may reduce the level of usefulness.

Guidelines is a category containing many related aspects (i.e., the guidelines' accessibility, comprehensiveness, difficulty or simplicity, currency, and familiarity with the guidelines). For instance, "FADGI addresses clearly the attributes to address for digitization -

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including environmental attributes for the digitization space, strategies for equipment selection and maintenance, etc. - very useful in all ways" (S215), referring to the simplicity of the guidelines. In a reference to the currency of guidelines, S224 said "Both the consortia and local guidelines are recently developed (within the last year) and still need to be updated occasionally to reflect newly encountered issues."

The *Hardware* category consists of a few responses referring to equipment in providing reasons related to the usefulness aspect. For instance, "Our own guidelines are the most useful, as they match our needs very well. The FADGI guidelines have more info than we can currently use with our equipment and labor. A certain consortium's guidelines include information that is not applicable to our processes" (S192). This response shows that their local guidelines are more convenient to their institution than FADGI guidelines, because of their equipment and staff.

Regarding the *Institution* category, S36 said "The guidelines are useful in formulating local digitization guidelines," which represents that the usefulness of the guidelines is in developing customized guidelines for the institution itself. Also, another subject provided a more detailed response by saying "The high level of detail and technical jargon present in the NARA and FADGI guidelines make them difficult to use as a regular part of our digitization workflow. Our internal standards are much simpler and better suited for the undergraduate students that conduct the actual scanning process" (S58), which explains why their local guidelines are more suitable for their institution as compared to other guidelines.

The *Metadata* category had only one response. S8 said "Our guidelines are useful for the amount of digitizing we do, but they are pretty basic and don't deal much with metadata or metadata standards, or with digitizing our more complicated materials." This response discusses

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the usefulness and simplicity of their own guidelines, but at the same time it reports metadata challenges due to adopting these guidelines.

Five responses were coded into the category *Physical Material*. Responses in this category refer to the items being digitized. For instance, S62 said "Sometimes we have to update the existing guidelines if we're scanning something we haven't scanned before," which shows that materials digitized for the first time require that the currently adopted guidelines be updated and maybe improved.

Usefulness reasons concerning the *Physical Space* were found in the collected data. This category refers to the location designed for the digitization process. For example, S215 said "FADGI addresses clearly the attributes to address for digitization - including environmental attributes for the digitization space, strategies for equipment selection and maintenance, etc. - very useful in all ways," emphasizing the usefulness and importance of providing information related to the place dedicated for the digitization process.

A total of six responses were coded into the category *Staff Awareness and Skills*. This category deals with staff knowledge and expertise. For instance, Unspecified Subject Number said "The guideline do not necessarily come with plans for training and implementation," which clearly states the need for including a section in these guidelines to facilitate implementation and staff training.

A reason related to *Storage* is the last of the reasons related to the usefulness of digitization guidelines for static media. Only one response was coded into this category. S107 said "I think the information is available, but at times I don't find it useful because we have resource limitations, money and space." This response shows that storage limitations may render

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the available information irrelevant, demonstrating a way in which usefulness levels might be affected by other factors or reasons.

4.1.2.2. Non-static (Audiovisual) Media

Only 36 subjects (52.94%) in the electronic questionnaire reported that their university digitizes non-static (audiovisual) media (e.g., voice recordings and analog videos), 8 subjects (11.76%) indicated that their University does not digitize this type of media, and 24 subjects (35.29%) did not provide responses to this question. The strategy for the digitization process of non-static (audiovisual) media at the subjects' universities was investigated as well. A total of 30 subjects (44.12%) reported that only unique materials are selected for digitization; however, only 11 subjects (16.18%) reported that all the materials are subject to digitization, whereas 27 subjects (39.71%) did not answer this question.

Digitization guidelines adopted by the subjects' universities for digitizing non-static (audiovisual) media were investigated as well. Table 4.15 shows the counts of the adopted digitization guidelines based on the collected data from the electronic questionnaire:

Table 4.15
Adopted Digitization Guidelines by Subjects' Universities for Digitizing Non-static (Audiovisual) Media

Digitization Guidelines	Count
ALCTS: Association for Library Collections & Technical Services	3
IASA: International Association of Sound and Audiovisual Archives	9
Consortium/Consortia digitization guidelines	6
University's own customized digitization guidelines	24

Other digitization guidelines. Please, specify	16
Total	75

For the option "Other digitization guidelines. Please, specify" in Table 4.15, only 16 subjects reported other digitization guidelines. Examples cited were, "NINCH, Sound directions" (S56), "Association of Recorded Sound" (S134), "NARA" (S215), "ARSC" (S104), and "http://www.aes.org" (S47). However, other subjects indicated different answers, such as "We send material to off-site digitization companies" (S8), "Vendor specification (for outsourcing)" (S169), and "No guidelines are used" (S36).

Subjects were asked, in the electronic questionnaire, about the technical specifications that they followed as their minimum requirements in those digitization guidelines of audio and video media. Tables 4.16 and 4.17 show the count of each technical specification for each type of media:

Table 4.16
Technical Specifications Subjects Follow as Their Minimum Requirements in the Digitization Guideline(s) of Audio Media

Technical Specifications	Count
Bit Depth	22
Bit Rate	22
Channel	16
Compression	24
Access File Format	25
Master File Format	30
Resolution	23
Sample Rate	22

Other. Please, specify	7
Total	191

Table 4.17

Technical Specifications Subjects Follow as Their Minimum Requirements in the Digitization Guideline(s) of Video Media

Technical Specifications	Count
Aspect Ratio	22
Compression	22
Data Rate (Bit Rate)	20
Field Rate	8
Access File Format	22
Master File Format	29
Frame Rate	21
Resolution	24
Sample Size (Bit Depth)	19
Sampling Scheme	9
Scanning	11
Video Standard	21
Other. Please, specify	7
Total	235

Regarding other technical specifications for audio media in Table 4.16 for the option "Other. Please, specify," seven responses were collected, such as: "PCM encoding" (S56), "Depends on the item" (S16), "No specifications are used" (S36), and "We don't digitize— someone else does according to their own specifications" (S197). On the other hand, a total of

seven responses were collected for technical specifications related to video media in the Table

4.17 for the option "Other. Please, specify." For instance, "We have not done much video

digitization" (S166), "We do not digitize film in house. We outsource it. The checked options for

this question are specifications that we discuss with vendors" (S111), "We don't digitize" (S197),

and "not my area" (S47).

Subjects were asked, through the electronic questionnaire, to indicate their compliance

level with the selected digitization guideline(s) for digitizing non-static (audiovisual) media. The

compliance level was designed as a 6-point Likert scale (*0% for Not At All Complied, whereas*

100% for Completely Complied). Table 4.18 shows a descriptive analysis for the collected

responses:

Table 4.18
A Descriptive Analysis for Compliance Level Regarding Adopted Digitization
Guidelines of Non-static (Audiovisual) Media

Digitization Guidelines	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
ALCTS: Association for Library Collections & Technical Services	1	5	3.22	1.47	2.17	9
IASA: International Association of Sound and Audiovisual Archives	1	5	3.73	1.42	2.02	11
Consortium/Consortia digitization guidelines	1	6	4.10	1.76	3.09	10
University's own customized digitization guidelines	1	6	4.83	1.46	2.14	23
Other digitization guidelines. Please, specify	1	6	3.83	1.67	2.81	12

Only 8 responses were given for the option "Other digitization guidelines. Please, specify" in Table 4.18. For example, "ARSC" (S104), "NINCH, Sound Directions" (S56), "Send AV materials off site" (S8), and "Professional experience" (S131).

Moreover, subjects were asked about the reasons for compliance with digitization guidelines for digitizing non-static (audiovisual) media by asking open-ended questions. Many responses were collected from the electronic questionnaire and semi-structured interviews, then coded based on their themes. A total of six types of reasons were explored as can be observed from Table 4.19:

Table 4.19
Reasons for Compliance with Digitization Guidelines for Digitizing Non-static
(Audiovisual) Media

Types of Reasons	Definitions
Access and Preservation	Reasons of compliance that are related to user's reach to information and long-term storage considerations.
Consistency, Standardization, and Sustainability	Reasons of compliance that are related to uniformity and stability considerations.
Guidelines	Reasons of compliance that are related to the adopted digitization guidelines and standards.
Hardware	Reasons of compliance that are related to the digitization equipment considerations.
Planning and Workflow	Reasons of compliance that are related to the design and implementation of procedures in the digitization process.
Staff Awareness and Skills	Reasons of compliance that are related to staff knowledge and expertise.

Figure 4.3 shows the frequency of the types of reasons indicated by academic librarians for their compliance with selected digitization guidelines for digitizing non-static (audiovisual) media:

Figure 4.3 Frequency of the types of reasons reported by academic librarians for complying with the adopted digitization guidelines to digitize non-static (audiovisual) media

Table 4.19 shows the types of reasons for the academic librarians' compliance with selected digitization guidelines, whereas collected responses were coded into at least one of these types. The groups of these types are listed based on their frequency, and the titles of these groups are italicized in the next paragraphs.

A majority of responses were classified under the category *Consistency, Standardization, and Sustainability*. This category includes responses concerning related themes. Achieving

consistency for digital preservation was derived from S134 by saying "For consistent preservation of valuable materials." Another subject introduced the aspect of interoperability with others in the same community by saying "For interoperability, foundational guidance, and participation with A/V digitization community efforts and directions" (S132).

Ten responses were coded into the *Access and Preservation* category. Responses in this group referred to the aspects of access and/or preservation. An example of a response referred to the access purpose is when S38 said "Ease of workflow and accessiblity [*sic*]." Another subject provided an example for the other aspect of this category (i.e., preservation) by saying "Need an external standard to guide us; need to create a reasonably high quality file for preservation, reuse" (S215).

Another type of reason to comply with digitization guidelines refers to *Planning and Workflow*. These may discuss any aspect of the digitization process starting from the institutions' goals or needs. For example, S111 said "Our in house and consortia guides meet our needs, especially for audio. We do not digitize film in house." This example clarifies that the reason for compliance is that the two types of digitization guidelines (i.e. in-house and consortia) are compatible with the institution's goals for the digitization project(s).

The fourth type of responses relate to *Guidelines*. Responses in this category indicated that digitization guidelines were a reason for such compliance. For example, "As with static media, we had no guidelines to start with when we began digitizing AV material, so we chose the ALCTS guidelines because they are easy to understand" (S53). This response demonstrates a lack of digitization guidelines for non-static (audiovisual) media at that institution, which led to adopting a specific set of digitization guidelines (i.e., ALCTS) because of its simplicity.

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The fifth type of reason refers to *Staff Awareness and Skills*. There, four responses describe awareness and knowledge on the part of the academic librarians regarding digitization guidelines. For instance, S207 said "Not a lot of knowledge or experience with sound & video files. We've used 2-3 different vendors and have followed their guidelines," which emphasized an issue concerning lack of knowledge in this domain to digitize non-static (audiovisual) media. Also, S107 said "we figured that these have been tested in other institutions or by other places. And that we are not as much of experts as they are, so we should kinda listen to what they say." These two examples clarify that help and guidance were sought from external sources outside their institutions.

Digitization equipment could be a reason, as well, to comply with digitization guidelines. Only two responses were classified under the *Hardware* category. For example, "We want to produce uniform files that are compliant with our access and archiving systems and playback software and hardware, so that materials can be viewed and accessed consistently across collections" (S168). Achieving compatibility between digital content and available equipment were observed from this response, which implies the importance of considering current equipment and software during the digitization process.

On the other hand, subjects were asked about the reasons that made them not comply with the adopted digitization guidelines in cases of non-compliance. Many responses were received from subjects through the electronic questionnaire and semi-structured interviews. Responses were categorized into 11 categories based on their types. Table 4.20 shows these categories and their definitions:

Table 4.20

Reasons for Non-Compliance with Guidelines for Digitizing Non-static (Audiovisual) Media

Types of Reasons	Definitions
Access and Preservation	Reasons of non-compliance that are related to user's reach to information and long-term storage considerations.
Funding	Reasons of non-compliance that are related to financial considerations.
Guidelines	Reasons of non-compliance that are related to the adopted digitization guidelines and standards.
Hardware	Reasons of non-compliance that are related to digitization equipment considerations.
Physical Material	Reasons of non-compliance that are related to the tangible media containing information.
Planning and Workflow	Reasons of non-compliance that are related to the design and implementation of procedures in the digitization process.
Software	Reasons of non-compliance that are related to computer programs.
Staff	
Staff Availability	Reasons of non-compliance that are related to staff presence.
Staff Awareness and Skills	Reasons of non-compliance that are related to staff knowledge and expertise.
Staff Time	Reasons of non-compliance that are related to the time devoted for digitizing non-static (audiovisual) media.
Storage	Reasons of non-compliance that are related to the capacity of the digital storage.

Responses related to not complying with selected digitization guidelines were analyzed based on the frequency of each of the types of reasons. Figure 4.4 shows this frequency:

Reasons for Not Complying with the Adopted Digitization Guidelines for Digitizing Non-static (Audiovisual) Media
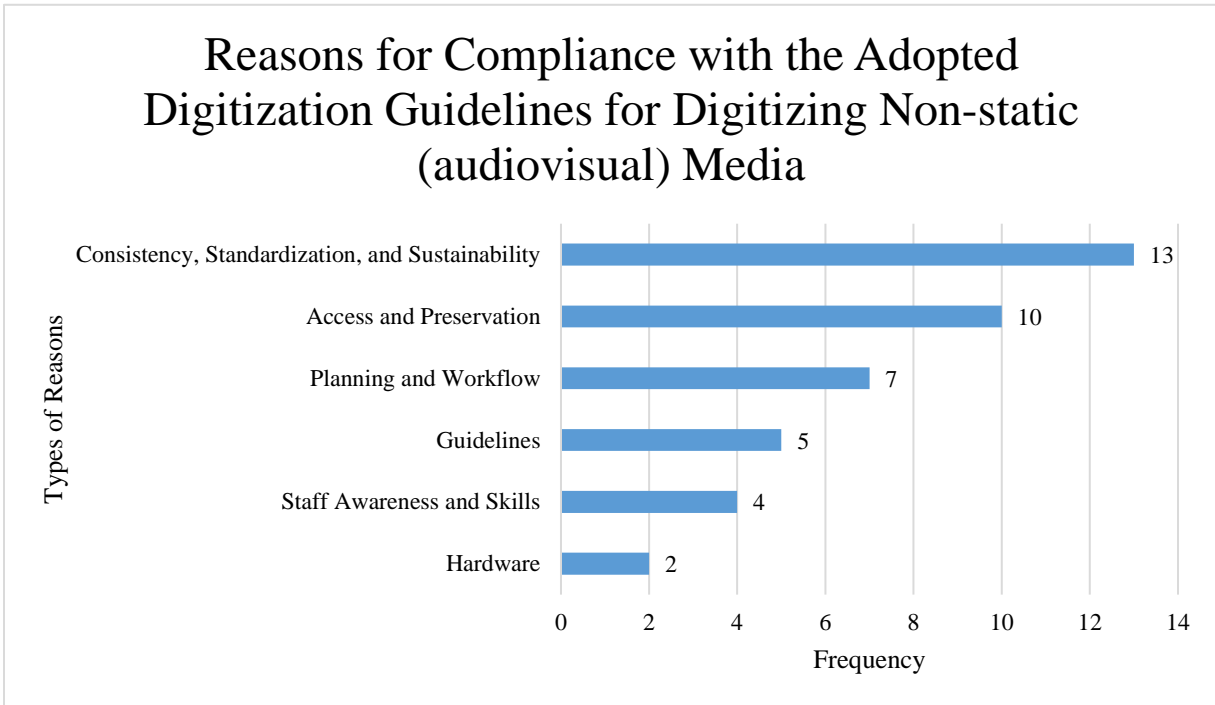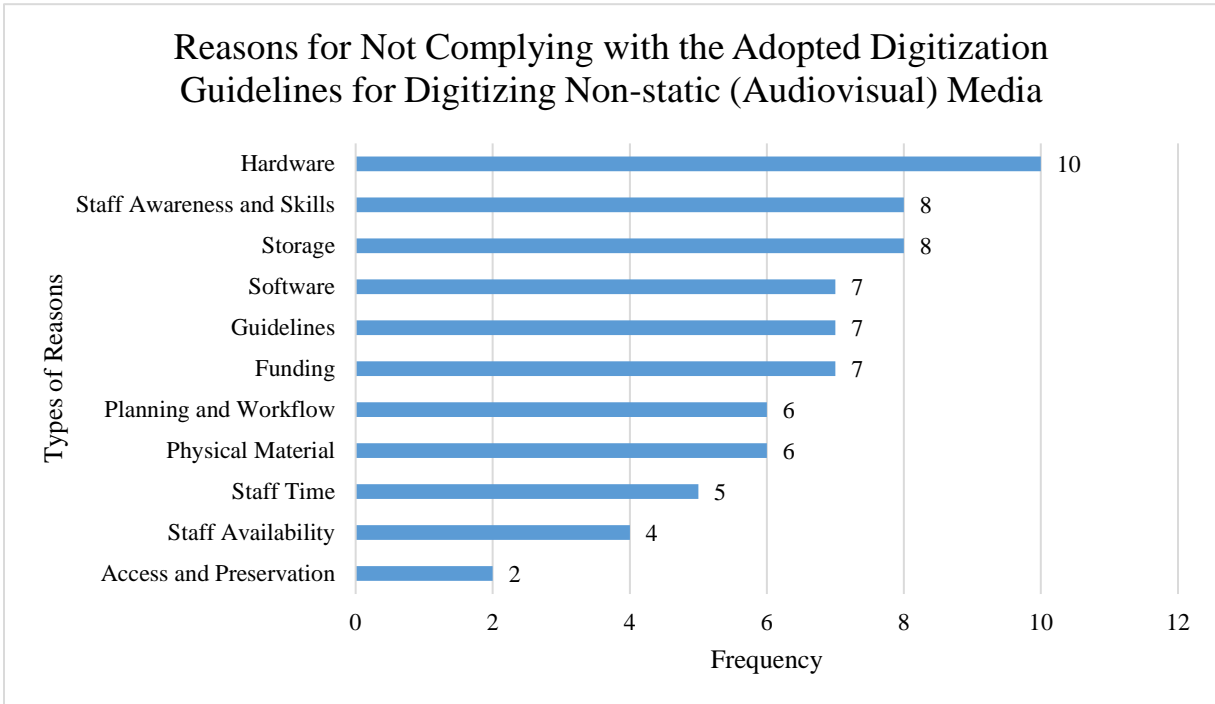
Figure 4.4 Frequency of the types of reasons reported by academic librarians for not complying with adopted digitization guidelines to digitize non-static (audiovisual) media

Categories of the types of reasons were listed based on their frequencies, whereas their titles were italicized in the next paragraphs. Also, examples were provided for more clarification. Reasons related to *Hardware* were explored. These responses explained how equipment may prevent them from complying with digitization guidelines. For example, "Sometimes, our equipment and software does not allow us to fully comply with ALCTS guidelines, so we get as close as possible within the scope of our understanding" (S53), which explains that limitations in digitization equipment may prevent complete compliance with adopted digitization guidelines. Another example was introduced by S56 and shows an issue with the current equipment by

saying "Difficulty with existing equipment and budget. Much easier to set the standards when outsourcing."

Reasons related to staff were categorized into three categories (i.e., *Staff Availability*, *Staff Awareness and Skills*, and *Staff Time*) for better analysis as explained earlier. "Human error happens" (S166) is an example of reasons related to *Staff Awareness and Skills*. This response demonstrates that mistakes and errors caused by the staff is considered as one reason leading to not complying with adopted digitization guidelines.

Storage is among the reasons found for not complying with digitization guidelines. A total of seven responses indicated how storage affects compliance levels. For instance, "Size of video files may determine capture specifications because of archival storage space restrictions" (S95). Regarding the storage aspect mentioned in this response, it emphasizes that the limited storage capacity has its impact on digitization decisions.

A total of seven responses were coded into the *Software* category for reasons of non-compliance. These responses indicated software issues either directly or indirectly. For instance, the statement by S104 "Equipment and software limitations and lack of adequate training" clarifies different issues that cause non-compliance, wherein software is one. Another example was provided by S111, who cited "…limitations of the software, and the cost of some of the software or equipment needed to digitize that kind of material," which refers not only to limitations of the software, but also to financial issues related to computer programs.

Reasons for non-compliance related to *Guidelines* were clearly observed in the collected data. Most indicated that digitization guidelines themselves might be a reason for not complying with them. For example, Unspecified Subject Number said "Our standards for master file

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formats and derivatives are still in development," which implies a current absence of available guidelines for two types of file formats. Another subject provided more details regarding their university not complying with the digitization guidelines by saying "It is particularly hard to comply with all video digitization standards due to storage concerns and ability to maintain software/hardware. We do not use lossless compressed preservation master files due to compatibility issues" (S168), in referring to various difficulties complying with the guidelines to digitize video materials.

Seven responses indicated that financial issues also have an effect that led to non-compliance. Reasons related to *Funding* were found within the data. For instance, S225 said "Costs," which represents a brief response for reasons to not comply with these digitization guidelines. Another subject explained in greater detail how their financial situation led to such non-compliance, saying that "Lack of compliance is based on environmental constraints of space and funding" (S132).

Six responses indicated different reasons for non-compliance, and were coded into the category *Planning and Workflow*. For instance, "Small digitizing jobs done on the fly might not follow the guidelines closely" (S62), which implies that the lack of careful planning and preparation for some digitization tasks may prevent complete compliance with the guidelines. Another subject provided a response that shows how the absence of a digitization policy may cause problems in complying with the guidelines to digitize non-static (audiovisual) media; this response is "Because our institution has not yet implemented a library-wide non-static digitization policy, nor do we have an official capability to do so (all digitization of non-static items is for conservation/storage/access purposes)" (S16).

The materials selected for digitization may lead to not complying with the adopted digitization guidelines. This type of response was grouped into the *Physical Material* category. For instance, "Size of video files may determine capture specifications because of archival storage space restrictions" (S95), which explains how file sizes created by certain type of materials may affect digitization decisions due to storage limitations. S169 provided a different reason for not complying, related to the value of the material itself, stating "Too resource intensive or material does not merit the investment."

The remaining two categories concerning staff are Staff Time and Staff Availability. "Materials designated for short-term access do not necessarily comply 100% with the guidelines, usually due to the short turn-around time required to deliver the digitized version to requestors" (S3) is an example of a *Staff Time* category response, which states that lack of having an adequate period of time to accomplish digitization activities may lead to incomplete compliance with the guidelines. The response "Sometimes lack of time or resources such as staffing" (S56) is an example of responses coded into the *Staff Availability* category. The latter example shows another aspect related to staff, which is availability or presence. It revealed that not having enough staff could also be considered as a reason for not complying with digitization guidelines.

Regarding *Access and Preservation*, responses in this category referred to restrictions that may lead to non-compliance with adopted digitization guidelines. Subjects indicated how access and preservation affect the level of non-compliance. For instance, "Standards for video are still emerging and file preservation is expensive. We may digitize at lower standards (for access only) so that archivists can appraise materials first, then outsource the digitization at higher standards if archivists assign high value to the item" (S134). This response implies how digitization for

access and high costs of digital preservation may lead to avoid following high quality

recommendations to digitize non-static (audiovisual) media.

Furthermore, subjects were asked via the electronic questionnaire to indicate their rate of

level of availability of needed information from the selected digitization guidelines for non-static

(audiovisual) media. The rating scale was designed based on a 6-point Likert scale (*0% indicates*

Not At All Available, whereas 100% indicates Completely Available). For this question,

availability means that the needed digitization recommendation for digitizing non-static

(audiovisual) media is available in the digitization guidelines used. Table 4.21 shows a

descriptive analysis for the collected responses:

Table 4.21
A Descriptive Analysis for Availability Level Regarding Adopted Digitization Guidelines for Non-static (Audiovisual) Media

Digitization Guidelines	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
ALCTS: Association for Library Collections & Technical Services	1	6	2.91	2.02	4.08	11
IASA: International Association of Sound and Audiovisual Archives	1	6	3.43	2.23	4.96	14
Consortium/Consortia digitization guidelines	1	6	3.38	2.27	5.16	13
University's own customized digitization guidelines	1	6	4.33	2.03	4.14	24
Other digitization guidelines. Please, specify	1	6	3.55	2.06	4.25	11

For the last option "Other digitization guidelines. Please, specify" in Table 4.21, only

seven responses were given by the subjects. For instance, "Sound Directions: Best Practices for

Audio Preservation" (S111), "NARA" (S215), "not sure" (S5), and "We don't digitize" (S197).

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The electronic questionnaire asked the subjects to answer a question about the reasons for their percentage rating regarding availability of the selected digitization guidelines. Also, the semi-structured interviews included a question about the availability of needed information in the digitization guidelines. Open coding for the qualitative data revealed four different types of reasons, which are: 1) *Guidelines*, 2) *Hardware*, 3) *Institution*, and 4) S*taff Awareness and Skills*. The following two paragraphs show examples of responses in these categories.

The *Guidelines* category contains many aspects related to digitization guidelines (i.e., accessibility to guidelines, alternative guidelines, comprehensiveness of guidelines, difficulty or simplicity of guidelines, and their currency). For instance, "There is not much available on AV digitization as the majority is not done on-site at academic libraries" (S169), shows lack of access and availability of needed information in guidelines to digitize non-static (audiovisual) media. Regarding comprehensiveness, S104 said "Audio standards are well documented and widely available, however video standards are often lacking or contradictory." This response speaks to availability and consistency issues concerning video digitization guidelines. However, only one response was coded into the *Hardware* category, because it referred to the equipment element in the digitization process. S111 said "…we are pretty good with sound. I would say yeah, it is easy to do, easy to follow, and we are able to do that but not with film because we just not have the equipment or expertise." This response clarifies the ability to digitize audio materials unlike film materials due to two issues, of which hardware is one.

Four responses were coded into the *Institution* category. This category means that the reason is related to the institution itself. For instance, S218 said "Our institution doesn't have the infrastructure to digitize non-static materials on a large-scale." This response is providing a reason related directly to the institution itself, which prevented large projects to digitize non-

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static (audiovisual) media. However, "Lack of knowledge of these guideline and the level to which we are complying when selecting an outside vendor" (Unspecified Subject Number) is an example of the responses coded into the *Staff Awareness and Skill* category, because it refers to the staff's knowledge and awareness regarding the mentioned digitization guidelines.

Based on the selected digitization guideline(s) in the electronic questionnaire by subjects for digitizing non-static (audiovisual) media, they were asked to indicate usefulness level (*0% indicates Not At All Useful, whereas 100% indicates Completely Useful*). The rating scale for this question was designed based on a 6-point Likert scale. Table 4.22 shows a descriptive analysis of the collected responses:

Table 4.22
A Descriptive Analysis for Usefulness Level Regarding Adopted Digitization Guidelines for Non-static (Audiovisual) Media

Digitization Guidelines	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
ALCTS: Association for Library Collections & Technical Services	1	6	2.91	1.83	3.36	11
IASA: International Association of Sound and Audiovisual Archives	1	6	3.85	2.03	4.13	13
Consortium/Consortia digitization guidelines	1	6	3.82	2.21	4.88	11
University's own customized digitization guidelines	1	6	4.50	2.02	4.07	22
Other digitization guidelines. Please, specify	1	6	4.50	1.91	3.65	10

Again, only seven responses were given by the subjects for the option "Other digitization guidelines. Please, specify" in Table 4.22. For example, "ARSC" (S134), and "Send off site" (S8).

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Subjects in the electronic questionnaire provided reasons for the usefulness level to the rating given to the selected digitization guidelines. Also, the semi-structured interviews collected data related to this aspect. Based on the themes of the collected responses, they were categorized into six categories: 1) *Guidelines*, 2) *Hardware*, 3) *Institution*, 4) *Physical Material*, 5) *Software*, and 6) *Staff Awareness and Skills*.

The *Guidelines* category included many related aspects (i.e., familiarity with the guidelines, their accessibility, their comprehensiveness, their difficulty or simplicity, their currency). Eleven responses referred to the guidelines in providing reasons of usefulness. For example, "The ALCTS guidelines are completely useful because they are easy to understand, and provide information to help our department better understand factors involved with AV digitization" (S53), which emphasizes that simplicity of a digitization guideline could be considered as a usefulness reason. Also, "The consortia are the most reliable resources that reflect the latest research in the field" (S3), which explains currency of digitization guidelines as an important aspect.

Reasons for usefulness related to *Hardware* were identified as well. For example, S168 said "…some non-expert vendors need very specific guidelines to create files compliant with software and hardware," representing an example of a usefulness reason related to the equipment. Eight responses were coded into the *Institution* category, because they refer to the institution's context. For instance, "We find our guidelines useful no matter what degree we choose to follow all that is in them" (S111).

Only four responses referred to *Physical Material* in providing reasons for usefulness of the non-static (audiovisual) media digitization guidelines. For instance, S95 said "We usually

need to consult other guidelines for video," which illustrates a need for using more guidelines to digitize video materials. It is assumed that this might refer to different issues, such as a limitation in the adopted digitization guidelines for videos, or to the complexity of the video material in the digitization process.

Only two reasons referred to computer *Software*. For instance, "It's very important to have specific guidelines for every aspect spelled out because…and having these spelled out and knowing which software can check these standards in QC makes it easier for non-expert staff to participate in the post-process portion of digitization." (S168), which refers to the importance of understanding the computer software involved in the digitization process as a usefulness reason.

Staff Awareness and Skills is the last category related to usefulness reasons of digitization guidelines for non-static (audiovisual) media. This category had only four responses. For instance, S168 said "It's very important to have specific guidelines for every aspect spelled out because fewer staff and students are knowledgeable about a/v formats…," showing the necessity of having clear guidelines to overcome any lack of knowledge or awareness that the staff may encounter in digitizing non-static (audiovisual) media.

4.2. Differences in compliance with the static and non-static (audiovisual) media digitization guidelines

This research question seeks information as to whether academic librarians differ in their compliance levels with adopted digitization guidelines. Six questions in the electronic questionnaire were designed, based on a Likert scale, to explore the levels of compliance (i.e.,

questions 19 and 34), availability (i.e., questions 22 and 37), and usefulness (i.e., questions 24 and 39). Comparisons were made between these questions in both sections of the electronic questionnaire, which are "Digitization of Static Media" and "Digitization of Non-static (Audiovisual) Media." In other words, levels of compliance were compared between static and non-static (audiovisual) media. Similarly, levels of availability and usefulness between these two sections were also compared. However, comparisons were made only to the digitization guidelines mentioned in both sections (i.e., ALCTS, consortium/consortia digitization guidelines, and university's own customized digitization guidelines).

The Wilcoxon Signed Ranks Test was chosen to compare paired data given by each subject for both types of media in the electronic questionnaire. For example, the levels of compliance given by a subject for "University's own customized digitization guidelines" for static media (i.e., Question 19) and non-static (audiovisual) media (i.e., Question 34) were compared statistically. The Paired Samples Test was chosen to conduct statistical analyses for quantitative data that had normal distribution (i.e., compliance levels for consortium/consortia guidelines and usefulness levels of ALCTS guidelines). However, selecting paired data led to a smaller amount of data used for the statistical analysis for this research question. Therefore, drawing any conclusions or interpretations must be made carefully and with caution, because of the small sample size used in the Wilcoxon Signed Ranks Tests for this question. Tables of the Paired Samples Tests (Tables 4.24 and 4.29) and Wilcoxon Signed Ranks Tests (Tables 4.23, 4.25-4.28, and 4.30-4.31) in the following sections (Sections 4.2.1.-4.2.3.) were based on the tables generated by IBM SPSS Statistics 25.

4.2.1. Compliance Levels

Compliance levels reported by the subjects were calculated statistically. Table 4.23 shows the Wilcoxon Signed Ranks Test conducted for the comparison of compliance levels with ALCTS digitization guidelines between static and non-static (audiovisual) media:

Table 4.23
Wilcoxon Signed Ranks Test for Compliance Level with ALCTS Digitization Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Compliance Level with	Negative Ranks	4[a]	3.63	14.50	-.850
ALCTS for Non-static	Positive Ranks	2[b]	3.25	6.50	.395
(Audiovisual) Media -	Ties	2[c]			
Compliance Level with	Total	8			
ALCTS for Static Media					

a. Compliance Level with ALCTS for Non-static (Audiovisual) Media < Compliance Level with ALCTS for Static Media
b. Compliance Level with ALCTS for Non-static (Audiovisual) Media > Compliance Level with ALCTS for Static Media
c. Compliance Level with ALCTS for Non-static (Audiovisual) Media = Compliance Level with ALCTS for Static Media

A Wilcoxon Signed Ranks Test indicated that the compliance level with ALCTS digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $z = -.850, p = .395$, so hypothesis 2.1.A is not rejected.

Several subjects rated their compliance levels with the consortium/consortia digitization guidelines for static and non-static (audiovisual) media. Table 4.24 shows the Paired Samples Test conducted for these two sets of data:

Table 4.24

Paired Samples Test for Compliance Level with Consortium/Consortia Digitization Guidelines

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Compliance Level with Consortium Guidelines for Static Media - Compliance Level with Consortium Guidelines for Non-static (Audiovisual) Media	-.286	1.254	.474	-1.445	.874	-.603	6	.569

A Paired Samples Test indicated that the compliance level with consortium/consortia digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $t = -.603, p = .569$, so hypothesis 2.1.B is not rejected.

The last comparison was made for compliance levels with the university's own customized digitization guidelines. Table 4.25 shows the Wilcoxon Signed Ranks Test conducted for these two sets of data:

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Table 4.25

Wilcoxon Signed Ranks Test for Compliance Level with the University's Own Customized Digitization Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Compliance Level with University Guidelines for Non-static (Audiovisual) Media - Compliance Level with University Guidelines for Static Media	Negative Ranks	10[a]	6.85	68.50	-1.696
	Positive Ranks	3[b]	7.50	22.50	.090
	Ties	9[c]			
	Total	22			

a. Compliance Level with University Guidelines for Non-static (Audiovisual) Media < Compliance Level with University Guidelines for Static Media
b. Compliance Level with University Guidelines for Non-static (Audiovisual) Media > Compliance Level with University Guidelines for Static Media
c. Compliance Level with University Guidelines for Non-static (Audiovisual) Media = Compliance Level with University Guidelines for Static Media

A Wilcoxon Signed Ranks Test indicated that the compliance level with the university's own customized digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $z = -1.696, p = .090$, so hypothesis 2.1.C is not rejected.

4.2.2. Availability Levels

Availability levels of the needed information in selected digitization guidelines were compared as well between static and non-static (audiovisual) media. Within the context of this doctoral dissertation, availability means that the needed digitization recommendation is available

in the digitization guidelines used for digitizing static/non-static (audiovisual) media as mentioned by questions 22 and 37 in the electronic questionnaire.

Availability levels of the needed digitization recommendations in the ALCTS guidelines were analyzed. Table 4.26 shows the conducted Wilcoxon Signed Ranks Test for the collected data:

Table 4.26
Wilcoxon Signed Ranks Test for the Availability Level of the Needed Digitization Recommendation in ALCTS Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Availability Level of the Needed Information in ALCTS for Non-static (Audiovisual) Media - Availability Level of the Needed Information in ALCTS for Static Media	Negative Ranks	1[a]	2.00	2.00	-.577
	Positive Ranks	2[b]	2.00	4.00	.564
	Ties	5[c]			
	Total	8			

a. Availability Level of the Needed Information in ALCTS for Non-static (Audiovisual) Media < Availability Level of the Needed Information in ALCTS for Static Media
b. Availability Level of the Needed Information in ALCTS for Non-static (Audiovisual) Media > Availability Level of the Needed Information in ALCTS for Static Media
c. Availability Level of the Needed Information in ALCTS for Non-static (Audiovisual) Media = Availability Level of the Needed Information in ALCTS for Static Media

A Wilcoxon Signed Ranks Test indicated that the availability level of needed information in ALCTS digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $z = -.577, p = .564$, so hypothesis 2.2.A is not rejected.

The second Wilcoxon Signed Ranks Test was conducted for the collected data regarding consortium/consortia digitization guidelines. Table 4.27 shows the statistical results:

Table 4.27
Wilcoxon Signed Ranks Test for the Availability Level of the Needed Digitization Recommendation in the Consortium/Consortia Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Availability Level of the Needed Information in Consortium Guidelines for Non-static (Audiovisual) Media - Availability Level of the Needed Information in Consortium Guidelines for Static Media	Negative Ranks	2[a]	1.50	3.00	-1.342
	Positive Ranks	0[b]	.00	.00	.180
	Ties	7[c]			
	Total	9			

a. Availability Level of the Needed Information in Consortium Guidelines for Non-static (Audiovisual) Media < Availability Level of the Needed Information in Consortium Guidelines for Static Media
b. Availability Level of the Needed Information in Consortium Guidelines for Non-static (Audiovisual) Media > Availability Level of the Needed Information in Consortium Guidelines for Static Media
c. Availability Level of the Needed Information in Consortium Guidelines for Non-static (Audiovisual) Media = Availability Level of the Needed Information in Consortium Guidelines for Static Media

A Wilcoxon Signed Ranks Test indicated that the availability level of the needed information in the consortium/consortia digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $z = -1.342, p = .180$, so hypothesis 2.2.B is not rejected.

The last Wilcoxon Signed Ranks Test was conducted for the availability levels related to the university's own customized digitization guidelines. Table 4.28 shows this statistical test:

Table 4.28

Wilcoxon Signed Ranks Test for the Availability Level of the Needed Digitization Recommendation in the University's Own Customized Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Availability Level of the Needed Information in University Guidelines for Non-static (Audiovisual) Media - Availability Level of the Needed Information in University Guidelines for Static Media	Negative Ranks	7[a]	4.93	34.50	-1.433
	Positive Ranks	2[b]	5.25	10.50	.152
	Ties	12[c]			
	Total	21			

a. Availability Level of the Needed Information in University Guidelines for Non-static (Audiovisual) Media < Availability Level of the Needed Information in University Guidelines for Static Media

b. Availability Level of the Needed Information in University Guidelines for Non-static (Audiovisual) Media > Availability Level of the Needed Information in University Guidelines for Static Media

c. Availability Level of the Needed Information in University Guidelines for Non-static (Audiovisual) Media = Availability Level of the Needed Information in University Guidelines for Static Media

A Wilcoxon Signed Ranks Test indicated that the availability level of the needed information in the university's own customized digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $z = -1.433, p = .152$, so hypothesis 2.2.C is not rejected.

4.2.3. Usefulness Levels

Subjects were asked in the electronic questionnaire (questions 24 and 39) to rate the usefulness levels for the selected guidelines to digitize static and non-static (audiovisual) media. A Paired Samples Test was conducted for the usefulness level of the ALCTS digitization guidelines. Two Wilcoxon Signed Ranks Tests were conducted for consortia/consortium and university digitization guidelines. A Paired Samples Test in Table 4.29 was conducted to evaluate the usefulness of the ALCTS guidelines in digitizing static and non-static (audiovisual) media:

Table 4.29
Paired Samples Test for the Usefulness Level of ALCTS Digitization Guidelines

Paired Samples Test

					Paired Differences			t	df	Sig. (2-tailed)
						95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper				
Pair 1	Usefulness Level of ALCTS for Static Media - Usefulness Level of ALCTS for Non-static (Audiovisual) Media	1.000	2.000	.816	-1.099	3.099		1.225	5	.275

A Paired Samples Test indicated that the usefulness level of ALCTS digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $t = 1.225, p = .275$, so hypothesis 2.3.A is not rejected.

A Wilcoxon Signed Ranks Test was conducted to determine usefulness levels of the

consortium/consortia digitization guidelines. Table 4.30 shows the results for this test:

Table 4.30
Wilcoxon Signed Ranks Test for the Usefulness Level of the Consortium/Consortia Digitization
Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Usefulness Level for Consortium Guidelines for Non-static (Audiovisual) Media - Usefulness Level for Consortium Guidelines for Static Media	Negative Ranks	1[a]	2.00	2.00	-.447
	Positive Ranks	1[b]	1.00	1.00	.655
	Ties	4[c]			
	Total	6			

a. Usefulness Level for Consortium Guidelines for Non-static (Audiovisual) Media <
Usefulness Level for Consortium Guidelines for Static Media
b. Usefulness Level for Consortium Guidelines for Non-static (Audiovisual) Media >
Usefulness Level for Consortium Guidelines for Static Media
c. Usefulness Level for Consortium Guidelines for Non-static (Audiovisual) Media =
Usefulness Level for Consortium Guidelines for Static Media

A Wilcoxon Signed Ranks Test indicated that the usefulness level of

consortium/consortia digitization guidelines for static media scores and non-static (audiovisual)

media scores were not statistically significantly different, $z = -.447, p = .655$, so hypothesis

2.3.B is not rejected.

The last Wilcoxon Signed Ranks Test for usefulness levels is related to the university's

own customized digitization guidelines used to digitize static and non-static (audiovisual) media.

Table 4.31 shows this statistical analysis:

Table 4.31

Wilcoxon Signed Ranks Test for the Usefulness Level of the University's Own Customized Digitization Guidelines

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Usefulness Level of University Guidelines for Non-static (Audiovisual) Media - Usefulness Level of University Guidelines for Static Media	Negative Ranks	5[a]	4.80	24.00	-1.706
	Positive Ranks	2[b]	2.00	4.00	.088
	Ties	11[c]			
	Total	18			

a. Usefulness Level of University Guidelines for Non-static (Audiovisual) Media < Usefulness Level of University Guidelines for Static Media

b. Usefulness Level of University Guidelines for Non-static (Audiovisual) Media > Usefulness Level of University Guidelines for Static Media

c. Usefulness Level of University Guidelines for Non-static (Audiovisual) Media = Usefulness Level of University Guidelines for Static Media

A Wilcoxon Signed Ranks Test indicated that the usefulness level of the university's own customized digitization guidelines for static media scores and non-static (audiovisual) media scores were not statistically significantly different, $z = -1.706, p = .088$, so hypothesis 2.3.C is not rejected.

4.3. Challenges face digitization of static and non-static (audiovisual) media

Exploring the challenges academic librarians face in digitizing static and non-static (audiovisual) media is one of the main themes of this doctoral dissertation. Data regarding digitization challenges were collected through use of an electronic questionnaire and semi-structured interviews. The results obtained from the data analysis conducted on the collected data

are presented in two different sections (Sections 4.3.1. and 4.3.2.) to compare the challenges

between static and non-static (audiovisual) media, in addition, tables and figures are introduced.

After presenting the tables of the types of these challenges in both sections, the following

paragraphs are arranged based on the frequencies of the types of challenges, and the title of each

type is italicized.

4.3.1. Static Media

Subjects answering the electronic questionnaire were asked (i.e., Question 26) to rate

their agreement level (*1 indicates Not At All Agree, whereas 7 indicates Extremely Agree*) on six

statements concerning different types of challenges facing static media digitization. These types

of challenges concern: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4)

digitization software, 5) staff digitization skills, and 6) the need for more professional training on

digitization. Table 4.32 shows a descriptive analysis for the collected responses:

Table 4.32
Agreement Levels with the following Statements Regarding the Challenges Faced in
Digitization of Static Media at the Examined Universities

Statements	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
University has adequate long-term budget for digitization project(s) of static media	1	7	3.74	1.92	3.67	46
University has adequate funding from external sources (other than the university itself) for digitization project(s) of static media	1	7	2.72	1.77	3.12	46
University has appropriate digitization equipment/hardware for digitizing static media	1	7	4.85	1.46	2.13	46

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University has appropriate digitization software for digitizing static media	1	7	5.22	1.40	1.95	45
University staff have adequate digitization skills for digitizing static media	2	7	5.35	1.35	1.84	46
University staff need more professional training on digitization skills for static media	1	7	4.41	1.75	3.07	46

Both the electronic questionnaire and semi-structured interviews included open-ended questions to ask the subjects about the challenges that they face in digitizing static media. The qualitative data collected through the electronic questionnaire and semi-structured interviews were analyzed together by conducting open coding. Table 4.33 lists the types of these challenges, along with their definitions:

Table 4.33
Challenges That Academic Librarians Face in Digitizing Static Media

Types of Challenges	Definitions
Copyright	Challenges concerning copyright and intellectual property issues.
Funding	Challenges concerning financial issues (e.g., continuous funding, digitization equipment, staff employment, software, and storage).
Guidelines	Challenges concerning digitization guidelines and standards (e.g., guidance, inflexibility of guidelines, and staff awareness).
Hardware	Challenges concerning digitization equipment (e.g., lack of equipment, oversized and/or particular materials, and staff skills and/or training).
Metadata	Challenges concerning the descriptive data of a digital object (e.g., metadata quality, and staff skills and time).

Physical Material	Challenges concerning the tangible media containing information (e.g., binding, deterioration, equipment, oversized and/or fragile materials, and staff skills and time).
Physical Space	Challenges concerning the digitization place or location (e.g., work space, space security, and storage environment).
Planning and Workflow	Challenges concerning the design and implementation of procedures in the digitization process (e.g., strategic plans, project management, prioritization, selection, handling materials, backlogs, naming conventions, quality control, and promoting collections).
Software	Challenges concerning issues related to computer programs (e.g., digital asset management systems, digital preservation systems, OCR, and staff training).
Staff	
Staff Availability	Challenges concerning staff presence and/or employment.
Staff Awareness and Skills	Challenges concerning staff knowledge and/or expertise (e.g., training).
Staff Time	Challenges concerning the time devoted for digitizing static media.
Storage	Challenges concerning storage issues (e.g., environmental storage, digital preservation, and server space).

Figure 4.5 shows the frequency of these 13 types of challenges academic libraries face in digitizing static media based on the collected data. These challenges are sorted from most to least frequently occurring ones:

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Challenges Face Academic Librarians in Digitizing Static Media
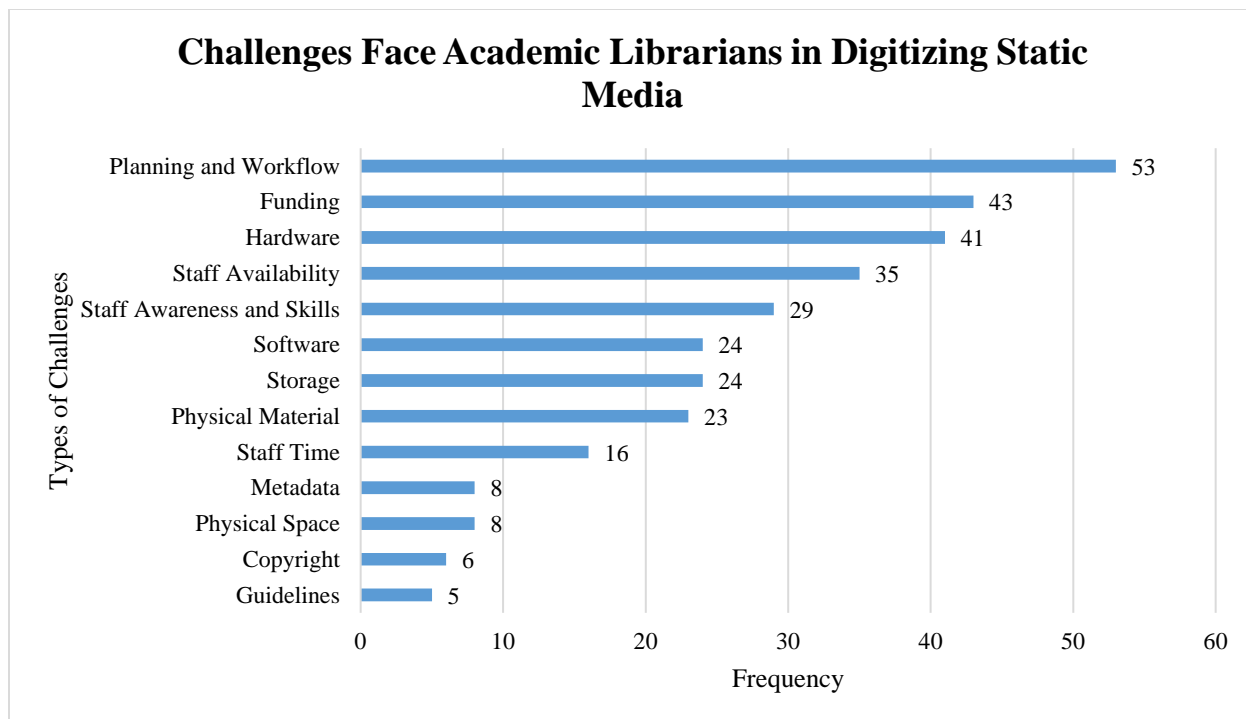
Figure 4.5 Frequency of the types of challenges facing academic librarians in digitizing static media

Table 4.33 shows 13 types of challenges that were explored through an open coding process for the qualitative data. Responses with similar themes were grouped together into a single category (e.g., *Copyright*, *Funding*, *Guidelines*, and *Hardware*), whereas each category may include sub-themes that are related to each other. Types or categories of these challenges are organized based on their frequencies in Figure 4.5, whereas the name of each category is italicized in the following paragraphs. Examples are presented, as well, to clarify the meaning of each type of challenge, but these examples may not refer to all aspects of each type of category.

Planning and Workflow is one of the main types of challenges reported by the subjects. Responses falling into this category indicated several issues such as those related to strategic planning, project management, prioritization, selection, naming conventions, quality control, or

promoting collections. For example, S47 said "Communicating a simple yet sophisticated set of goals for a program of digitization that can be used to generate more support among senior University administrators, faculty, students, and external funders (donors, foundations)" in a reference to the necessity of having well-designed goals for digitization programs to enhance cooperation between different groups of stakeholders. Also, "No defined digitization prioritization plan" (S104), indicated that the absence of a plan for prioritization may create an issue. S38 said "promotion of collections once they have been digitized and are available," which shows that steps needed to be taken after digitizing an item, such as promoting the newly-digitized content.

The second type of challenge is *Funding*, which contains many sub-themes including: continuous funding, employing staff or even the cost of replacing some digitization equipment. Although these responses referred to different aspects, all indicated the effect of funding on those they mentioned. For example, S224 said "Inconsistent funding for workers & technology (mostly through donations to library, which cannot be relied on)" to emphasize the effect of funding on staff and technology. S134 said "Replacing equipment for the digitization of transparent media (negatives). High end equipment is expensive" to clarify that replacing digitization equipment for specific media is a challenge because of the expenses. Moreover, having funding could be not an issue, but maintaining a continuous funding is a challenge, as S176 mentioned when raising the issue of "Continued funding for large projects."

Hardware is the third type of challenge that was explored during data analysis process. This type concerns the challenges related to digitization equipment or even needed expertise to use that equipment. Responses referred to different aspects such as: lack of equipment for specific types of materials (e.g., oversized materials) and staff skills to work with the digitization

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equipment. For instance, an Unspecified Subject Number cited "Access to capital for equipment

purchases" as an example of the impact of funding challenges on purchasing equipment.

Hardware issues may refer to issues with the equipment available in handling specific types of

formats as noted by S105: "Computers aren't powerful enough to manage large batches of

TIFFs." Absence of suitable equipment to digitize large format materials could be challenging as

reported by an Unspecified Subject Number who said that: "We do not have the equipment to

digitize large format (>12x17) flat materials."

Open coding revealed many responses addressing staff issues. However, these responses

were classified into three categories in order to better represent each type. They are: *Staff*

Availability, *Staff Awareness and Skills*, and *Staff Time*. Responses related to *Staff Availability*

refer to the lack of available staff to conduct digitization. For example, "Not enough staff in

support of digitization projects" (S104), shows that lack of enough staff to conduct the

digitization process could be an issue. However, another challenge with staffing was reported by

S147 by saying "Staff turnover, especially with student workers" to emphasize that staff

shortages can be caused by those who leave digitization job, such as student employees. Also,

"Personnel - looking to fill a vacancy with a faculty-level position which would expand our

reach into digital scholarship" (S207), which shows the need for staff with specific

qualifications.

Staff Awareness and Skills is the second category of challenges concerning staff. This

category contains challenges related to the staff's knowledge, awareness, expertise, and training.

For instance, S117 stated that "Lack of training and knowledge in digitization standards" to

reveal that needed knowledge and training regarding digitization standards are absent. Also, S87

noted "Lack of professional development opportunities," which highlighted the absence of the

appropriate opportunities to professionally develop staff skills. Moreover, S146 said

"Interpersonal problems," which implies issues concerning communication skills among staff

members.

Challenges related to software issues were grouped under *Software*. Responses in this

category discussed several issues concerning software, such as digital asset management, digital

preservation systems, OCR, and staff training related to software. For instance, "Inability for

systems to easily share data; (i.e. it is hard to output inventories from an archival system to reuse

for the digitization process)" (S169), referring to compatibility issues between different computer

systems. Also, some issues may occur because of software used in digitization of static media, as

S118 said "A more expedient OCR software for bulk materials. We use ABBYFineReader but

on instances can be inconsistent." Moreover, responses indicated issues with staff skills in

dealing with software during the digitization process, as S134 said "Training and expertise

working with software for OCR and preparing files textual for later use."

Storage challenges include responses concerning issues such as: server space,

environmental storage, and digital preservation. For instance, "Lack of a solid preservation plan"

(S95), which indicates the absence of a good plan to guide preservation procedures. Lack of

adequate digital storage space could be an issue as well; for instance, S105 said "Not enough

server support." Although most storage issues referred to the digital environment, the physical

environment was mentioned as well; for instance, "These materials are housed in environments

that are not optimal and usually receive the least amout [*sic*] of attention or care" (S3).

Another type of challenge relates to the *Physical Material* itself. Many issues affect

physical material chosen for digitization, such as binding and deterioration. These challenges

include fragile and oversized materials as well. A total of 23 collected responses were grouped under this type of challenge. For instance, S5 said "Large formats, brittle content, content that is wavy or not flat," which indicates that material may suffer from many issues that cause a challenge during digitization. Also, condition of the physical material and lack of equipment may cause another challenge as reported by S215 through saying "…we don't have necessarily a good well book cradle or other method for effectively capturing a page image you know without a shadow when it, when there's a tight binding…."

The third category of challenges related to staff issues is *Staff Time*. This type of challenge indicated that staff time could be an issue in the digitization process. Responses provided different examples of how time could be a challenge while digitizing static media. For instance, "Time constraints on equipment use" (S36), which might emphasize limitations on both time and equipment. Some materials may need more time during digitization than others; for instance, "Digitizing small transparency formats can be time-consuming…" (S168). Also, S45 said "Performing mass digitization in a timely manner" to clarify that conducting digitization on a given time frame may be a challenge as well.

Metadata is one of the types of challenges that academic librarians face in digitizing static media. This type of challenge includes themes related to metadata such as the quality of the metadata, or even the availability of a staff member for processing metadata tasks. For instance, S169 said "Metadata backlogs ; enhancing metadata for large-scale digitization projects," which indicates ways in which handling metadata affects digitization workflow. Also, S207 said "Filling other personnel positions, especially metadata experts" in reference to another challenge facing static media digitization, which is the absence of specialized staff qualified in handling metadata.

Physical Space is another type of challenge explored in the collected responses. This type of challenge refers to the place designed for the digitization process. Collected responses referred to issues related to this space including the storage environment, and space security. For instance, "Space - finding a dedicated "digitization lab" or workstations" (S224), which reports the absence of having a specialized place for digitization. Other types of spaces are needed as well like the storage area as S150 said "…the money to maintain the storage environment that you need…," indicating that the conditions of the storage environment are also important.

Six responses were grouped under *Copyright*, as they referred to copyright issues. These responses show that copyright could be a challenge in digitizing static materials at academic libraries. Subjects provided responses to indicate this challenge in different ways. For example, S36 stated "Management of Intellectual Property Rights" to refer to this issue in general. Also, copyright issues might be connected with other aspects such as time, for instance; S208 said "Time for copyright review" to emphasize the time devoted to this activity in the digitization process.

Guidelines was the least frequently-occurring type of challenge reported by academic librarians during data collection. This type of challenge refers to those related to guidelines such as: inflexibility, complying with them, or staff awareness about them. For instance, S117 said "Lack of training and knowledge in digitization standards" to emphasize the absence of awareness or training concerning digitization standards. Although guidelines provide recommendations to enhance the digitization process, following them might be a challenge as reported by S58 who stated "Consistent adherence to digitization guidelines (image quality, naming conventions, etc.)." Another subject S107 indicated their awareness of the guidelines, but

not the ability to comply with them due to storage restrictions, "… sometimes veer away from the guidelines because we just don't have the server space to hold images that big…."

4.3.2. Non-static (Audiovisual) Media

Subjects completing the electronic questionnaire were asked to rate their agreement levels on six statements regarding challenges facing the digitization of non-static (audiovisual) media (i.e., Question 41). The rating of these agreement levels was designed based on a 7-point Likert scale (*1 indicates Not At All Agree, whereas 7 indicates Extremely Agree*). The statements are concerning different challenges face digitizing non-static (audiovisual) media: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4) digitization software, 5) staff digitization skills, and 6) the need for more professional training on digitization. Table 4.34 shows a descriptive analysis for the collected responses:

Table 4.34
Agreement Levels with the following Statements Regarding Challenges in Digitization of Non-static (Audiovisual) Media at Examined Universities

Statements	Minimum	Maximum	Mean	Standard Deviation (SD)	Variance	Count
University has adequate long-term budget for digitization project(s) of non-static (audiovisual) media	1	6	2.43	1.61	2.59	35
University has adequate funding from external sources (other than the university itself) for digitization project(s) of non-static (audiovisual) media	1	6	2.06	1.22	1.48	35
University has appropriate digitization equipment/hardware for digitizing non-static (audiovisual) media	1	6	2.60	1.52	2.30	35

University has appropriate digitization software for digitizing non-static (audiovisual) media	1	7	3.26	1.84	3.39	35
University staff has adequate digitization skills for digitizing non-static (audiovisual) media	1	7	3.29	1.72	2.95	35
University staff need more professional training on digitization skills for non-static (audiovisual) media	1	7	5.00	2.11	4.46	35

Qualitative data about the challenges facing the digitization of non-static (audiovisual) media were collected from academic librarians through the electronic questionnaire and semi-structured interviews. Academic librarians provided different responses regarding the challenges they face in digitizing non-static (audiovisual) media. Responses with similar themes or concepts were grouped into one category representing a type of challenge. A total of 14 types of challenges were explored based on the conducted data analysis for the collected responses. These types are organized based on their frequencies in the next paragraphs; their titles are italicized. Examples of some aspects of each type are mentioned for more clarification. Table 4.35 contains the types of challenges, alongside their definitions:

Table 4.35
Challenges Academic Librarians Face in Digitizing Non-static (Audiovisual) Media

Types of Challenges	Definitions
Copyright	Challenges concerning copyright and intellectual property issues.
Funding	Challenges concerning financial issues (e.g., costs of digitization equipment, outsourcing, staff training, storage, and transcribing).

Guidelines	Challenges concerning digitization guidelines and standards (e.g., staff awareness, and variety and/or difficulty of guidelines).
Hardware	Challenges concerning digitization equipment (e.g., lack of equipment, oversized and/or particular materials, and staff skills and training).
Metadata	Challenges concerning the descriptive data of a digital object (e.g., staff skills and time).
Physical Material	Challenges concerning tangible media containing information (e.g., equipment, format decay, oversized materials, staff skills and training, software, storage, variation of formats, and sticky shed syndrome).
Physical Space	Challenges concerning the digitization place or location.
Planning and Workflow	Challenges concerning the design and implementation of procedures in the digitization process (e.g., backlogs, decision making, goals, prioritization, quality control, and selection).
Software	Challenges concerning issues related to computer programs (e.g., AV editing software, digital preservation systems, and staff training).
Staff	
Staff Availability	Challenges concerning staff presence and/or employment.
Staff Awareness and Skills	Challenges concerning staff knowledge and/or expertise (e.g., training).
Staff Time	Challenges concerning the time devoted for digitizing non-static (audiovisual) media.
Storage	Challenges concerning storage issues (e.g., digital preservation, environmental storage, and server space).
Transcription	Challenges concerning creating textual content for the non-static (audiovisual) materials.

Figure 4.6 displays the frequency of each type of challenges that academic librarians face in digitizing non-static (audiovisual) media based on the collected data:

Challenges Face Academic Librarians in Digitizing Non-static (Audiovisual) Media

Types of Challenges	Frequency
Hardware	39
Funding	33
Staff Awareness and Skills	31
Physical Material	30
Storage	27
Planning and Workflow	26
Guidelines	10
Staff Availability	10
Software	9
Staff Time	9
Copyright	3
Physical Space	3
Metadata	2
Transcription	1
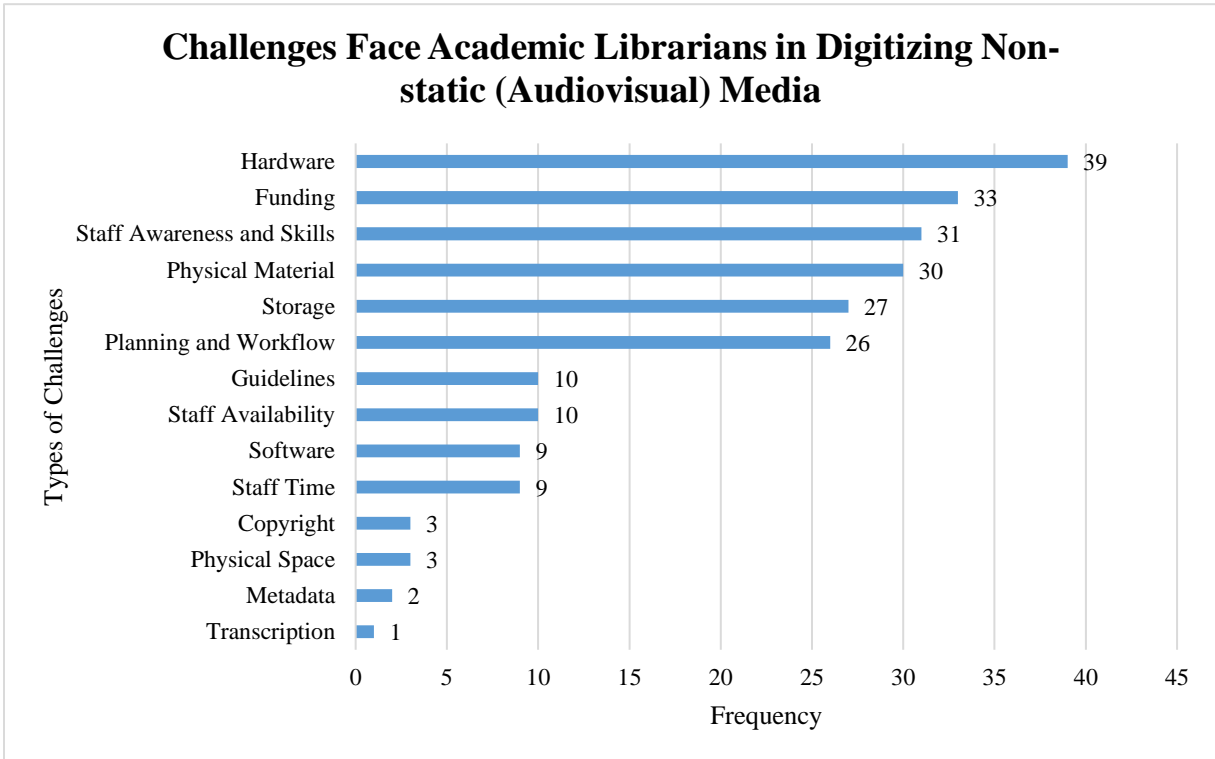
Figure 4.6 Frequency of the types of challenges academic librarians face in digitizing non-static (audiovisual) media

The most frequent type of challenge related to *Hardware*. Respondents reported some issues that related directly in some way to digitization equipment or hardware. Subjects mentioned different aspects such as: lack of equipment, or even the skills and training needed for using such equipment. S104 said "Lack of training in using and maintaining hardware," which refers to the absence of needed training to handle equipment or hardware. S58 said "Variety of different formats, each requiring specialized hardware" to show ways in which the differing natures of physical materials cause hardware-related issues. Similarly, Unspecified Subject

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Number said "We do not have enough A/V digitization equipment (we need professional cassette decks, VHS VCR, U-Matic, 1/4" audio, and EIAJ VTR)" to emphasize that variations in digitization equipment due to availability of different materials is a challenge.

Data analysis revealed that financial issues are still considered as one of the main types of challenges. *Funding* challenges are connected to other aspects of the digitization process such as costs of digitization equipment, outsourcing, staff training, transcribing, and storage. As a reference to the impact of funding issues on other digitization aspects such as outsourcing and equipment, S95 said "Lack of funding for either outsourcing or equipment for in-house digitization." Moreover, limited funding has an impact on opportunities for enhancing staff skills; for example, "Skills required for digitization of film and video require regular and costly training" (S134). Also, S166 said "…with the digital file we always need to have a transcription and that is very time consuming or costly to outsource transcribing oral histories," which represents another impact of the funding issue, this one related to the creation of textual content for non-static (audiovisual) media.

Responses concerning staff engagement in digitizing non-static (audiovisual) media were also reported. These responses were categorized into three categories: *Staff Availability*, *staff Awareness and Skills*, and *Staff Time*. Regarding *Staff Awareness and Skills*, this category includes responses related to staff knowledge, expertise, or training. A total of 31 responses indicated issues related in some way to this type of challenge. For instance, S53 said "Nobody in our library, including myself, has any extensive professional background in AV digitization," which indicates a lack of professional knowledge in digitizing non-static (audiovisual) media. Another example was introduced by S59, who stated that "We lack expertise in the audiovisual arena about file formats or even media formats…" in referring to a lack of expertise in certain

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areas related to non-static (audiovisual) media digitization. Regarding the effect of training on staff skills, S134 said "Skills required for digitization of film and video require regular and costly training," emphasizing the high costs of training staff in digitizing film and video.

The *Physical Material* itself could be a challenge during the digitization of non-static (audiovisual) media. This challenge includes many related aspects, such as: format decay, needed equipment, oversized materials, staff skills and training, sticky shed syndrome, software, storage, and variation of formats. "Necessity to digitize before formats can no longer be accessed" (S36) is an example of how elapsed time has a negative impact on undigitized formats. Some physical materials could be a target for other issues as well; for example, "Our AV collections include problem items such as Umatic tapes with sticky shed syndrome. We are physically equipped to deal with the problem, but not adequately trained" (S53). Also, the size of some materials may prevent digitizing them as mentioned by S111 who stated that "We currently cannot digitize audio reel-to-reel center on that are bigger than 7 inches diameter."

Storage presents a significant type of challenge facing the digitization of non-static (audiovisual) media as realized by the data analysis. Within this context, storage refers to many aspects, such as: digital preservation, environmental storage, and server space. S3 provided an example for the physical storage to store materials by saying "…basic environmental storage…." On the other hand, capacity of digital storage was indicated by the collected responses. For example, "…the storage space again because those files for sound and video are much much bigger than static media…" (S111) in a reference to digital storage issues for this type of media. Similarly, S95 said "Large file sizes for media and need to store and preserve them," again showing the problem with storing non-static (audiovisual) media.

Challenges regarding *Planning and Workflow* were explored during analysis of the collected data. This type of challenge includes several aspects related to planning and workflow of the digitization process, such as: backlogs, decision making, goals, prioritization, quality control, and selection. Since these aspects are related to the entire digitization process and workflow, they were grouped together into one category rather than having several smaller ones. For example, "Lack of support from upper management" (S139) is one of the responses coded into this category, which describes administrative and planning issues concerning digitization. Regarding materials' selection and prioritization for digitization, an example of a prioritization challenge was introduced by S104 through saying "Lack of digitization prioritization process," whereas the selection challenge regarding selecting materials was introduced by S36 through saying "Identifying appropriate materials for digitization."

Many issues connected to *Guidelines* were found among the collected responses. This type of challenge concerns either the guidelines themselves (e.g., their difficulty) or other related aspects (e.g., staff awareness regarding digitization guidelines). Subjects reported different responses that fell into these types of challenges. For instance, S58 said "Lack of background and knowledge in AV digitization standards and workflows," referring to staff awareness and knowledge of standards and steps required for digitizing these types of materials. Digitization guidelines for some materials may have issues in their contents; for example, S111 said "I found that film or motion picture guidelines and best practices for digitization are not very well developed, there is a lot of variety out there as far as file format, it is just complicated."

Regarding *Staff Availability*, ten responses revealed issues related to availability and/or employment of staff. "We outsource all non-static materials because we don't have the equipment or staff" (S59), which shows unavailability of staff members as well as lack of

equipment. An example for the unavailability of staff members for certain tasks of the

digitization process was introduced by S107 by saying "…if they're looking for checksums, we

have a hard time implementing those because we just don't have the technical staff to be able to

do it." However, staff shortages might occur because of the limited number of staff members; for

instance, S62 said "Although we have instructions floating around, only one or two people in the

department do the work regularly enough to perform tasks quickly and efficiently."

Different responses were reported by subjects regarding types of *Software* engaged in

digitizing non-static (audiovisual) media. Responses in this category concerned different types of

software such as AV editing, digital preservation systems, and staff training on software use. For

example, "Lack of training in using software" (S104) is a general example for staff skills in

dealing with software. However, S215 provided an example for a certain type of software by

saying "Training and skills to work with AV editing software," which explains a challenge

encountered by staff in handling this type of computer program. Digital preservation systems

may cause issues as well, as indicated from S117 who stated that "…it does again take time to,

you know, put digitized content into some of these systems like our digital preservation system

or Omeka," which emphasizes also the needed time to manage these computer programs and

systems.

The time element in the digitization process was reported by 9 responses, grouped

together into the *Staff Time* category. This category represents issues related to the staff time

devoted to digitizing non-static (audiovisual) media. For instance, Unspecified Subject Number

said "Too much to digitize and not enough time" to clarify that the load of the materials selected

for digitization could cause time constraints. Also, the nature of these materials may require

plenty of time to digitize them; for example, "Real time playback required for most formats,

which is time consuming" (S58). Specific procedures or aspects of the digitization process may consume more time than others; for example, "Time investment to train students" (S94).

Responses concerning *Copyright* issues were found during the open coding process. Three responses revealed that copyright is considered a challenge in digitizing non-static (audiovisual) media. The first two examples used different terminology in their reference to copyright issues, which are "Copyright issues" (S16) and "Intellectual property/rights management issues" (S36). More explanation regarding the impact of the copyright challenge was mentioned by S56 through saying "…we might have copyright issues that might lead to some complexity and either preventing us from sharing it broadly…," which shows a connection between copyright issues and information sharing.

Physical Space was also reported as a challenge during digitizing non-static (audiovisual) media. This challenge concerns the place used or needed for digitizing non-static (audiovisual) media. For example, S166 said "Physical space," which is a brief and direct way to refer to this challenge. More explanation was provided by S111 about the lack of physical space to digitize certain items through saying "…we have to go out of our way to digitize a vinyl or shellac record that is rotate to 78 RPM.…We can digitize the 78s, but we got to go to a different building on campus…." Also, S56 referred to the challenge of having a specialized physical place for digitization that is not used for other purposes by saying "…used under the umbrella of a different purpose like a student multimedia lab or public space that might prevent a long-term project from happening."

Subjects revealed *Metadata* issues in their responses. These issues discussed two major themes: either the needed expertise or the time devoted to creating metadata. Only two responses

were coded into this type of challenge in digitization of non-static (audiovisual) media. S107 said "…making metadata again for a very complex object and that can take a lot of staff time" in a reference to the considerable time spent in creating metadata for this type of media. On the other hand, S117 said "…finding the time and again expertise to have someone do that is a challenge," which shows how lack of time and experience may negatively impact creating metadata for non-static (audiovisual) media.

Only one response was reported regarding the challenge of *Transcription* within the context of digitizing non-static (audiovisual) media. This type of challenge was found only during analyzing collected data for the non-static (audiovisual) media, because of the different nature of this type of media. S166 reported this challenge as "…with the digital file we always need to have a transcription and that is very time consuming or costly to outsource transcribing oral histories," which reveals that creating textual content for the non-static (audiovisual) media requires adequate time and funding.

In working with this rich trove of information, it became clear that academic libraries face challenges in digitizing static and non-static (audiovisual) media. Although these challenges differ, the majority occurred in digitizing both types of media (i.e., static and non-static [audiovisual] media). Several differences were realized through comparing the digitization challenges of static and non-static (audiovisual) media (Figures 4.5 and 4.6). First, financial issues challenges (i.e., *Funding*) ranked second among other challenges for both static and non-static (audiovisual) media. This shows the strong impact of funding on digitization projects at academic libraries. Second, the challenge related to digitization equipment/hardware (i.e., *Hardware*) was ranked first for non-static (audiovisual) media, whereas it was ranked third for

static media. This may imply that digitization equipment for non-static (audiovisual) media are harder to acquire or handle as compared to that required for static media.

Third, the challenge related to staff knowledge and expertise (i.e., *Staff Awareness and Skills*) ranked third for non-static (audiovisual) media; it was ranked fifth for static media. This may point to the reality that digitizing non-static (audiovisual) media requires more knowledge and skills as compared to those required to digitize static media. Fourth, the challenge related to storage (i.e., *Storage*) ranked fifth for non-static (audiovisual) media, whereas it was ranked seventh to static media. This may be a result of the large file sizes produced in digitizing audiovisual materials, as understood from the collected data. Lastly, the challenge related to guidelines (i.e., *Guidelines*) ranked last for static media, whereas for non-static (audiovisual) media it ranked seventh. This may indicate that subjects face more difficulties in digitization guidelines for non-static (audiovisual) media than they do for static media.

4.4. Differences in challenges facing digitization of static and non-static (audiovisual) media

This research question aims to draw comparisons between the statements of challenges that are encountered in digitization of static and non-static (audiovisual) media. Statistical analyses for levels of agreement were performed to compare these two sets of statements in the electronic questionnaire (i.e., questions 26 and 41). These statements referred to different aspects of the digitization process, which are: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4) digitization software, 5) staff digitization skills, and 6) the need for more professional training on digitization.

Only paired data were included for the statistical analyses to perform Wilcoxon Signed

Ranks Tests. Each statement in Question 26 was compared to its equivalent in Question 41. For

example, the collected data for the statement "University has adequate long-term budget for

digitization project(s) of static media" was compared statistically to data of the statement

"University has adequate long-term budget for digitization project(s) of non-static (audiovisual)

media." IBM SPSS Statistics 25 software was used to perform the Wilcoxon Signed Ranks Tests

comparing these two datasets, and Tables 4.36-4.46 are based on the tables generated by this

software.

Regarding whether the university has a long-term budget for digitization projects of static

media comparing to non-static (audiovisual) media, agreement levels given to the statements

"University has adequate long-term budget for digitization project(s) of static media" and

"University has adequate long-term budget for digitization project(s) of non-static (audiovisual)

media" were calculated statistically. Tables 4.36 and 4.37 show the conducted Wilcoxon Signed

Ranks Test for the budget aspect:

Table 4.36
Descriptive Statistics of the Wilcoxon Signed Ranks Test for Statements Regarding the Budget

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Agreement Level for Budget of Static Media	35	3.54	1.900	1	7
Agreement Level for Budget of Non-static (Audiovisual) Media	35	2.43	1.632	1	6

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Table 4.37

Wilcoxon Signed Ranks Test for the Statements Regarding Budget

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Agreement Level for	Negative Ranks	21[a]	11.45	240.50	-3.759
Budget of Non-static	Positive Ranks	1[b]	12.50	12.50	.000
(Audiovisual) Media -	Ties	13[c]			
Agreement Level for	Total	35			
Budget of Static Media					

a. Agreement Level for Budget of Non-static (Audiovisual) Media < Agreement Level for Budget of Static Media

b. Agreement Level for Budget of Non-static (Audiovisual) Media > Agreement Level for Budget of Static Media

c. Agreement Level for Budget of Non-static (Audiovisual) Media = Agreement Level for Budget of Static Media

A Wilcoxon Signed Ranks Test indicated that the agreement level of budget for static media scores were statistically significantly higher than the non-static (audiovisual) media scores, $z = -3.759, p = .000$, so hypothesis 4.1 is rejected.

The Wilcoxon Signed Ranks Test was calculated for the second two statements, which are "University has adequate funding from external sources (other than the university itself) for digitization project(s) of static media" and "University has adequate funding from external sources (other than the university itself) for digitization project(s) of non-static (audiovisual) media." Table 4.38 shows the statistical analysis for these two statements:

Table 4.38

Wilcoxon Signed Ranks Test for the Statements Regarding External Funding

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Agreement Level for Funding from External Sources for Non-static (Audiovisual) Media - Agreement Level for Funding from External Sources for Static Media	Negative Ranks	15[a]	11.33	170.00	-1.921
	Positive Ranks	6[b]	10.17	61.00	.055
	Ties	14[c]			
	Total	35			

a. Agreement Level for Funding from External Sources for Non-static (Audiovisual) Media < Agreement Level for Funding from External Sources for Static Media

b. Agreement Level for Funding from External Sources for Non-static (Audiovisual) Media > Agreement Level for Funding from External Sources for Static Media

c. Agreement Level for Funding from External Sources for Non-static (Audiovisual) Media = Agreement Level for Funding from External Sources for Static Media

A Wilcoxon Signed Ranks Test indicated that the agreement level of funding from external sources for static media scores were not statistically significantly different from non-static (audiovisual) media scores, $z = -1.921, p = 0.055$, so hypothesis 4.2 is not rejected.

The third statements chosen for comparison are "University has appropriate digitization equipment/hardware for digitizing static media" and "University has appropriate digitization equipment/hardware for digitizing non-static (audiovisual) media." A Wilcoxon Signed Ranks Test was conducted for the given agreement levels by subjects for these two statements. Tables 4.39 and 4.40 show these statistics:

Table 4.39

Descriptive Statistics of the Wilcoxon Signed Ranks Test for Statements Regarding the Digitization Equipment/Hardware

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Agreement Level for the Digitization Equipment/Hardware for Static Media	35	4.71	1.405	1	7
Agreement Level for the Digitization Equipment/Hardware for Non-static (Audiovisual) Media	35	2.60	1.538	1	6

Table 4.40

Wilcoxon Signed Ranks Test for the Statements Regarding Digitization Equipment/Hardware

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Agreement Level for the Digitization Equipment/Hardware for Non-static (Audiovisual) Media - Agreement Level for the Digitization Equipment/Hardware for Static Media	Negative Ranks	29[a]	17.40	504.50	-4.545
	Positive Ranks	3[b]	7.83	23.50	.000
	Ties	3[c]			
	Total	35			

a. Agreement Level for the Digitization Equipment/Hardware for Non-static (Audiovisual) Media < Agreement Level for the Digitization Equipment/Hardware for Static Media

b. Agreement Level for the Digitization Equipment/Hardware for Non-static (Audiovisual) Media > Agreement Level for the Digitization Equipment/Hardware for Static Media

c. Agreement Level for the Digitization Equipment/Hardware for Non-static (Audiovisual) Media = Agreement Level for the Digitization Equipment/Hardware for Static Media

A Wilcoxon Signed Ranks Test indicated that the agreement level of digitization equipment/hardware for static media scores were statistically significantly higher than the non-static (audiovisual) media scores, $z = -4.545, p = .000$, so hypothesis 4.3 is rejected.

Regarding digitization challenges related to software, a Wilcoxon Signed Ranks Test was conducted to compare the following two statements: "University has appropriate digitization software for digitizing static media," and "University has appropriate digitization software for digitizing non-static (audiovisual) media." Given agreement levels by subjects for these two statements were compared statistically to observe whether there is any significant difference. Tables 4.41 and 4.42 show the conducted statistical analysis:

Table 4.41
Descriptive Statistics of the Wilcoxon Signed Ranks Test for Statements Regarding the Digitization Software

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Agreement Level for the Digitization Software of Static Media	34	5.06	1.476	1	7
Agreement Level for the Digitization Software of Non-static (Audiovisual) Media	34	3.21	1.871	1	7

Table 4.42

Wilcoxon Signed Ranks Test for the Statements Regarding Digitization Software

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Agreement Level for the Digitization Software of Non-static (Audiovisual) Media - Agreement Level for the Digitization Software of Static Media	Negative Ranks	26[a]	15.31	398.00	-4.485
	Positive Ranks	2[b]	4.00	8.00	.000
	Ties	6[c]			
	Total	34			

a. Agreement Level for the Digitization Software of Non-static (Audiovisual) Media < Agreement Level for the Digitization Software of Static Media

b. Agreement Level for the Digitization Software of Non-static (Audiovisual) Media > Agreement Level for the Digitization Software of Static Media

c. Agreement Level for the Digitization Software of Non-static (Audiovisual) Media = Agreement Level for the Digitization Software of Static Media

A Wilcoxon Signed Ranks Test indicated that the agreement level of digitization software for static media scores were statistically significantly higher than the non-static (audiovisual) media scores, $z = -4.485, p = .000$, so hypothesis 4.4 is rejected.

A Wilcoxon Signed Ranks Test was conducted for both sets of paired data related to the statements "University staff have adequate digitization skills for digitizing static media" and "University staff has adequate digitization skills for digitizing non-static (audiovisual) media." Tables 4.43 and 4.44 represent the results of this test:

Table 4.43

Descriptive Statistics of the Wilcoxon Signed Ranks Test for Statements Regarding Staff Digitization Skills

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Agreement Level for the Digitization Skills for Static Media	35	5.34	1.305	2	7
Agreement Level for the Digitization Skills for Non-static (Audiovisual) Media	35	3.29	1.742	1	7

Table 4.44

Wilcoxon Signed Ranks Test for Statements Regarding Staff Digitization Skills

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Agreement Level for the Digitization Skills for Non-static (Audiovisual) Media - Agreement Level for the Digitization Skills for Static Media	Negative Ranks	31[a]	16.00	496.00	-4.908
	Positive Ranks	0[b]	.00	.00	.000
	Ties	4[c]			
	Total	35			

a. Agreement Level for the Digitization Skills for Non-static (Audiovisual) Media < Agreement Level for the Digitization Skills for Static Media

b. Agreement Level for the Digitization Skills for Non-static (Audiovisual) Media > Agreement Level for the Digitization Skills for Static Media

c. Agreement Level for the Digitization Skills for Non-static (Audiovisual) Media = Agreement Level for the Digitization Skills for Static Media

A Wilcoxon Signed Ranks Test indicated that the agreement level of digitization skills for static media scores were statistically significantly higher than the non-static (audiovisual) media scores, $z = -4.908, p = .000$, so hypothesis 4.5 is rejected.

A Wilcoxon Signed Ranks Test was conducted for the statements "University staff need more professional training on digitization skills for static media" and "University staff need more professional training on digitization skills for non-static (audiovisual) media." Tables 4.45 and 4.46 show this test:

Table 4.45
Descriptive Statistics of the Wilcoxon Signed Ranks Test for Statements Regarding the Need for more Professional Training on Digitization

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Agreement Level for the Need of More Professional Training on Digitization for Digitizing Static Media	35	4.46	1.615	1	7
Agreement Level for the Need of More Professional Training on Digitization for Digitizing Non-static (Audiovisual) Media	35	5.00	2.142	1	7

Table 4.46
Wilcoxon Signed Ranks Test for Statements Regarding the Need for more Professional Training on Digitization

Ranks

		N	Mean Rank	Sum of Ranks	Z P Value
Agreement Level for the Need of More Professional Training on	Negative Ranks	9[a]	12.11	109.00	-1.957
	Positive Ranks	18[b]	14.94	269.00	.050
	Ties	8[c]			

Digitization for Digitizing Non-static (Audiovisual) Media - Agreement Level for the Need of More Professional Training on Digitization for Digitizing Static Media	Total	35

a. Agreement Level for the Need of More Professional Training on Digitization for Digitizing Non-static (Audiovisual) Media < Agreement Level for the Need of More Professional Training on Digitization for Digitizing Static Media

b. Agreement Level for the Need of More Professional Training on Digitization for Digitizing Non-static (Audiovisual) Media > Agreement Level for the Need of More Professional Training on Digitization for Digitizing Static Media

c. Agreement Level for the Need of More Professional Training on Digitization for Digitizing Non-static (Audiovisual) Media = Agreement Level for the Need of More Professional Training on Digitization for Digitizing Static Media

A Wilcoxon Signed Ranks Test indicated that the agreement level for the need of more professional training on digitization for digitizing non-static (audiovisual) media scores were statistically significantly higher than the static media scores, $z = -1.957, p = .050$, so hypothesis 4.6 is rejected.

4.5. Applied or suggested solutions to overcome these challenges

Exploring solutions to the encountered digitization challenges adds another dimension to this doctoral dissertation. Two types of solutions (i.e., applied and suggested) were investigated for the challenges involving digitization of static and non-static (audiovisual) media at academic libraries in the United States. Examining these solutions helps in improving understanding. Both

the electronic questionnaire and semi-structured interviews collected qualitative data regarding the solutions for digitizing static and non-static (audiovisual) media.

Again, these solutions were classified into two major categories, applied solutions and suggested solutions. Applied solutions represent those already applied at the academic libraries examined, whereas those suggested represent desired solutions that have not yet been applied. Both applied and suggested solutions to static media are discussed in one section (Section 4.5.1.), whereas the applied and suggested solutions regarding non-static (audiovisual) media are discussed in another section (Section 4.5.2.). In each section, applied solutions are presented first, followed by suggested solutions. Further, tables and figures are introduced in which the paragraphs for the types of applied and suggested solutions are arranged based on the frequency of the categories or types of solutions. Additionally, the title for each category of solution type is italicized.

4.5.1. Static Media

Data collected from the electronic questionnaire and semi-structured interviews regarding applied solutions for digitizing static media were analyzed together. Table 4.47 shows the types of applied solutions by academic librarians for digitizing static media, along with their definitions:

Table 4.47

Solutions Academic Librarians Applied to Static Media Digitization

Types of Applied Solutions	Definitions
Funding	Solutions applied to financial issues (e.g., raising funds, outsourcing, and seeking grants).
Guidelines	Solutions applied to the issues of guidelines and standards (e.g., compliance to guidelines, identifying standards, and updating the adopted standards).
Hardware	Solutions applied to digitization equipment issues (e.g., book cradle, hardware for large formats, outsourcing maps digitization, purchasing equipment, and tethered capture).
Metadata	Solutions applied to the issues of the descriptive data of a digital object (e.g., coordinating with metadata department, DACS compliance, and preparing metadata).
Physical Material	Solutions applied to the issues of the tangible media contains information (e.g., adjusting the standards, outsourcing oversized materials, preparing fragile materials, and prioritization).
Physical Space	Solutions applied to the issues of digitization place or location (e.g., setting up a room).
Planning and Workflow	Solutions applied to the issues regarding designing and implementation of the procedures in the digitization process (e.g., communication, documentation, fragile materials assessment, and prioritization).
Software	Solutions applied to issues of the computer programs (e.g., ArchiveSpace, Confluence, OCR, and Trello).
Staff	
Staff Availability	Solutions applied to issues regarding staff presence and/or employment.
Staff Awareness and Skills	Solutions applied to issues regarding staff knowledge and/or expertise (e.g., communication, staff meetings, and training program).

| *Staff Time* | Solutions applied to issues regarding the time devoted for digitizing static media. |
| **Storage** | Solutions applied to storage issues (e.g., digital preservation and server space). |

Figure 4.7 shows the frequency of types of applied solutions used by academic libraries to overcome the challenges involved in digitization of static media. These frequencies represent data collected from the electronic questionnaire and semi-structured interviews:
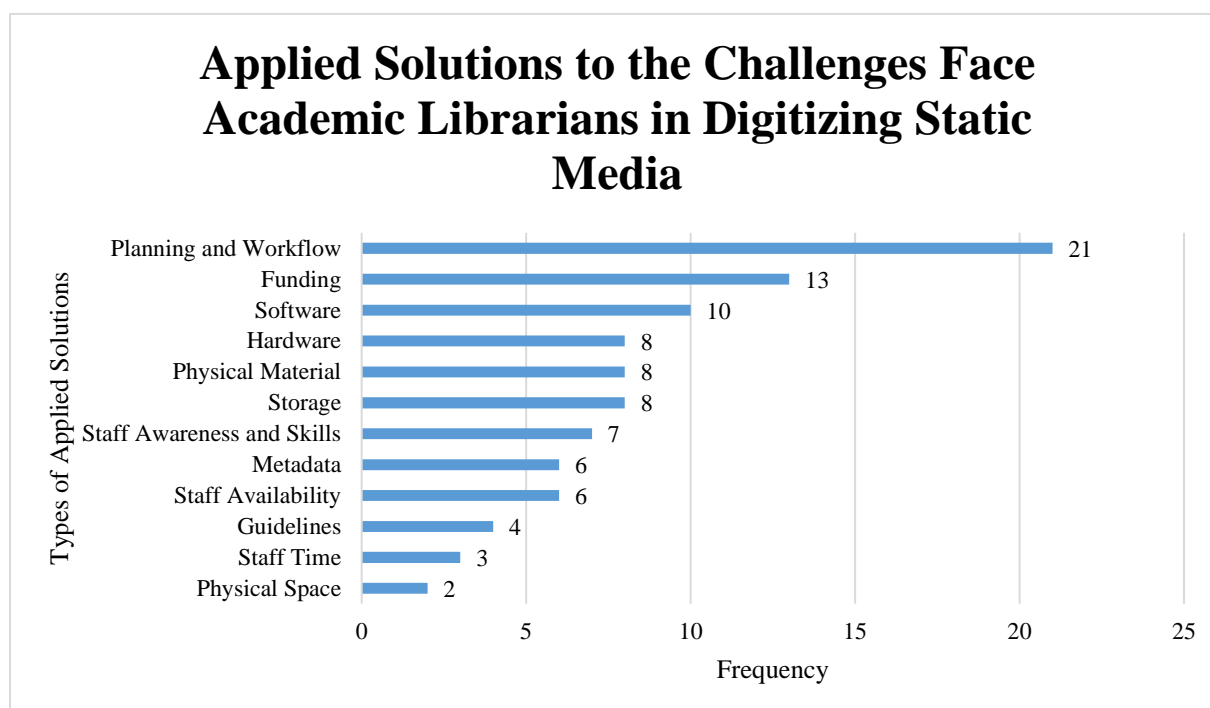

Figure 4.7 Frequency of the types of solutions applied by academic librarians to overcome the challenges of static media digitization

Subjects were asked about the solutions applied to overcome challenges in digitization of static media. Different responses were collected through the electronic questionnaire and semi-

structured interviews. Collected data were classified into various categories of applied solutions based on their themes. A total of 12 categories of applied solutions were identified regarding static media digitization.

Planning and Workflow is the main category of applied solutions since 21 responses were coded into it. This category describes solutions applied to challenges faced in planning and/or workflow of the digitization process. It includes different aspects of the digitization process such as fragile material assessment, prioritization, documentation, and communication among staff. "We are in the process of writing an extensive Digital Workflow Process document in collaboration with stakeholders from across the library: digital collections, special collections, systems, metadata" (S146) is an example of an applied solution to the digitization workflow. Also, S16 said "…the reference staff currently compile usage stats and then the curators use that as a guide, their choices for next digitization projects," which shows an example related to planning and selection in the digitization process.

Subjects reported applied solutions related to *Funding*. This category contains responses related to issues such as raising funds, outsourcing, and seeking grants. Few responses indicated how funding helped with staffing issues in digitization projects; for instance, S16 said "We pay student employees very well in order to promote longevity in this position (since the training processes on scanning are very long and experienced students perform much faster than new students)." Likewise, S224 said "We are trying to raise funds to endow a digital special collections librarian," another example of how funding helps in staff employment. Funding also helped in outsourcing digitization as well; for instance, "We're moving to outsourcing the digitization of some formats because digitization in-house is too costly" (S134).

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Software category contains solutions that were applied to the digitization process of static media. Responses discussed different types of software like ArchiveSpace, Confluence, OCR, and Trello. For example, "…we use Trello which is like an online tool for, you know, communicating our project which is not magic but it allows you to sort of put your tracking documentation in one place…" (S150), which emphasizes the benefit of using a computer program for communication and documentation purposes in the digitization process. S59 said "… we are now using Golden Thread for color and and sharpness calibration and to check our conformity to the FADGI star ratings" in a reference to using computer software to enhance digitization.

Hardware is another category containing responses related to applied solutions for static media digitization. Although this category contains different responses, they discuss one main theme, which is digitization equipment/hardware. These responses may discuss book cradle, purchasing equipment, or digitization equipment suitable for large format materials. For instance, "…we have applied for capturing for example large-format materials are using photography high pixel cameras and appropriate lenses….We've also purchased lighting and other sort of staging materials for those large-format items in order to stage them in a way that allows us to capture them as best we can" (S215), which clarifies that solutions were applied to digitization equipment for oversized materials. An example was introduced by S150 about changing the method of capturing images through saying "…we've switched to a tethered capture…and that has been a big improvement for us and it has allowed for a better coordination….And so having a more streamlined workflow has really helped us to be able to do that and to implement some of the FADGI guidance on digitization…."

Subjects mentioned different responses related to *Physical Material*. These solutions were dependent on the materials that are selected for digitization. Preparing fragile materials, prioritization, and outsourcing oversized materials are examples of responses in this category. An example of prioritization in digitizing materials was indicated from S107 who said, "We drew up a list of endangered materials that were also highly used and so if we can digitize those first….So we are prioritizing those materials in order to get the at-risk materials done first…." Regarding handling fragile materials, S168 said "I require that our preservation staff assess fragile formats and perform stabilization or rehousing in preparation for digitization."

Applied solutions related to *Storage* issues were also found in the collected data. This type of solution discusses themes related to storage, including digital preservation and server space. For instance, "Administration continues to support expanded storage and digital preservation measures actively; campus also provides reasonable and appropriate storage for digital assets" (S215), which shows an applied solution to solve the storage challenge. Also, S107 said "…instead of just applying the standards directly and just flatly for every object in hand, we are looking at it and deciding…at what resolution we're going to digitize, and at what bit rates we're going to do that in order to try and preserve our server space…," which refers to adjusting the adopted standards to maintain the storage issue.

The digitization processes depend on staff as well; hence, a total of 16 applied solutions were found regarding staff issues. These solutions were classified into three categories for more precise analysis, which are: *staff Availability*, *Staff Awareness and Skills*, and *Staff Time*. The *Staff Awareness and Skills* category discusses solutions applied to the awareness and skills of staff, such as: staff meetings, training programs, and communication. For example, "I think we have kind of a to-do for staff listed on the library intranet.…they've in one of the monthly staff

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meetings about two years ago, they did demonstration and instructed everyone how to create

pick lists of items to digitize" (S16), which illustrates examples of staff communication and

awareness. An example for staff training was introduced by S59 through saying "…by

purchasing those equipment, the software were using can be used on both pieces even though

their different manufacturers, so were being more efficient and having to train our staff only on

one application versus multiple."

Applied solutions related to *Metadata* issues were found also in the collected data. These

solutions discussed different themes such as establishing coordination with the metadata

department, or preparing the needed metadata. For example, S16 said "…we foster weekly

meetings with our metadata department in order to coordinate the, yeah the cataloging, the

cataloging aspect that comes after digitization" in a reference to cooperation with another

department to handle the metadata of digitized materials. Another example was introduced by

S166 for solving metadata issues by creating a computer database through saying "…we had our

IT department create a SQL-based database…that could be logged into and shared among all the

stakeholders…we will know which student created something because their login will be the one

associated with it, but they'll also have to put the file size which we want to have for our our

technical metadata, they'll have to put the date digitized which is one of our metadata fields…."

Only six responses were related to the category *Staff Availability*. This category of applied

solutions relates to staff presence and/or employment. For instance, S56 said "We have had great

funding, I guess that would help because that a lot of have a full-time position and extra

equipment being added for short-term project" in a reference to employing staff for digitization

projects. Also, S117 said "…we do rely on student workers to help with some of the

workload…," which shows that the university is employing students in the digitization process.

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A total of four responses were coded into the *Guidelines* category, because of their relation to this type of applied solution. During the open coding process, it was found that responses in this category mentioned solutions such as updating the current standards, or checking the status of a compliance to a standard. For example, "I plan to ask our curators to come up with a percentage of their collections that are and are not DACS compliant" (S16), which shows a solution regarding examining the standards' adoption and compatibility. Updating the current standards is another example of the applied solution as it was indicated from S168 by saying "We've changed the standards probably once every 18 to 24 months in the time I've worked for my institution, which is good.…we're always adopting cleaner standards that are going to produce better digital surrogates of the media."

The last type of applied solution relating to staff issues is the *Staff Time*. The title of this group provides a clear explanation of its theme. This category discusses solutions applied to issues regarding the time devoted for digitizing static media. Only three responses were grouped into this type of applied solutions. For example, "…we are prioritizing those materials in order to get the at-risk materials done first, and also make the best use of our staff time…" (S107), which explains how prioritization may help with staff time issues. Also, S150 said "…we have a phase 1 like camera-back and a reprographic camera, we have basically two operators to kind of use that continuously rather than having say five student digitizing separate portions of a collection…then have to all be re-collated together which was very time consuming and confusing," which shows that the digitization method affects staff time spent on digitizing items.

Physical Space was also considered by the subjects when they discussed applied solutions for static media. This category of applied solutions focuses on the physical place or location used for the digitization process. Only two responses were coded into this category of applied

solutions. For example, S215 said "…we make use of a of a room for to do the photography that we have to reset every time…," which refers to the lack of having a permanent and specialized place for digitization.

Suggested solutions is the second type examined regarding digitizing static media. Both the electronic questionnaire and semi-structured interviews inquired about these types of solutions. Table 4.48 shows the types of these suggested solutions and their definitions:

Table 4.48
Solutions Academic Librarians Suggested for Static Media Digitization

Types of Suggested Solutions	Definitions
Copyright	Solutions suggested for copyright and intellectual property issues (e.g., intellectual property rights management).
Funding	Solutions suggested for financial issues (e.g., advocacy, increasing annual budget, and seeking grants).
Guidelines	Solutions suggested for guidelines and standards issues (e.g., guidance and simplifying the guidelines).
Hardware	Solutions suggested for digitization equipment issues (e.g., equipment for oversized materials, purchasing equipment, and training staff).
Metadata	Solutions suggested for the issues of descriptive data of a digital object (e.g., DACS compliance and hiring metadata staff).
Physical Material	Solutions suggested for the issues of tangible media contains information (e.g., handling fragile materials, nitrate films, and scanning oversized materials).
Physical Space	Solutions suggested for the issues of digitization place or location (e.g., new building and renovation).
Planning and Workflow	Solutions suggested for issues regarding designing and implementation of procedures in the digitization process (e.g., developing workflows, documentation, institution's

	commitment, quality checks, MPLP, preservation plan, prioritization, renovation plan, and selection).
Software	Solutions suggested for issues related to computer programs (e.g., federated sites and OCR)
Staff	
Staff Availability	Solutions suggested for issues regarding staff presence and/or employment.
Staff Awareness and Skills	Solutions suggested for issues regarding staff knowledge and/or expertise (e.g., attending meetings, communication, education, and training).
Staff Time	Solutions suggested for issues regarding the time devoted to digitizing static media.
Storage	Solutions suggested for storage issues (e.g., checksums, digital preservation, digital repository, and server space).

Based on data analysis of the electronic questionnaire and semi-structured interviews, Figure 4.8 shows the frequency of the types of solutions suggested by academic librarians to overcome challenges faced in digitizing static media:
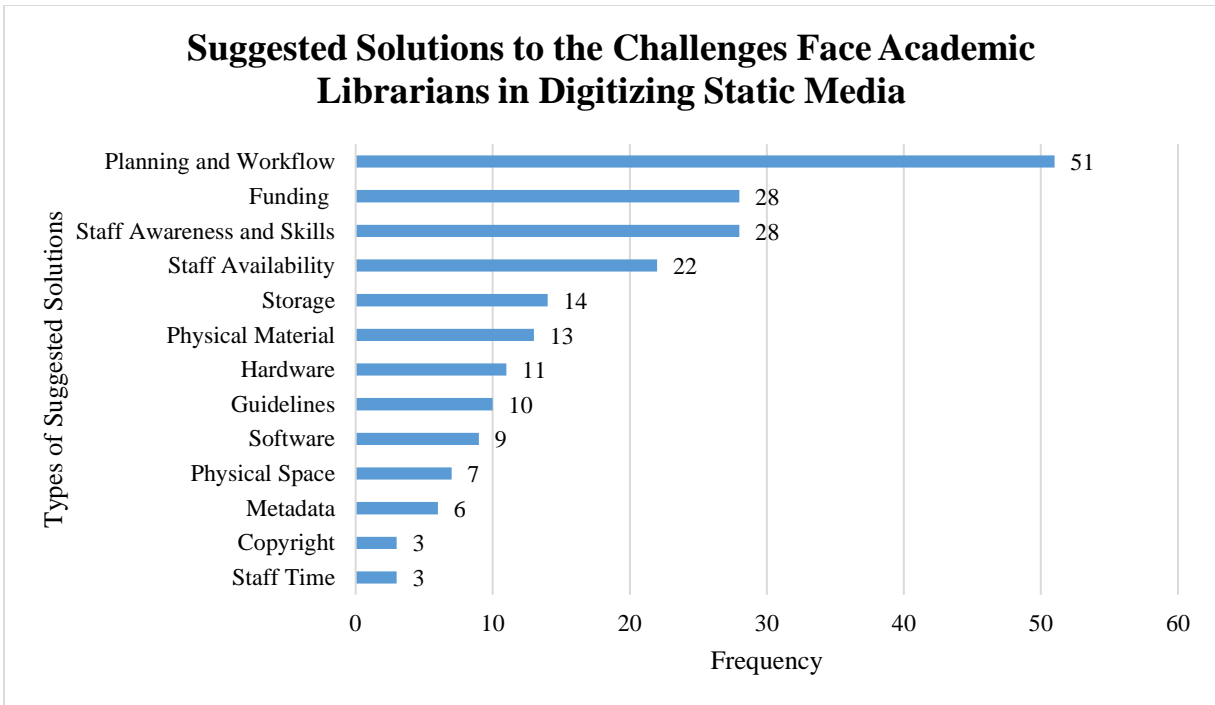
Suggested Solutions to the Challenges Face Academic Librarians in Digitizing Static Media

Figure 4.8 Frequency of the types of solutions suggested by academic librarians to overcome the challenges faced in static media digitization

Subjects provided suggested solutions to overcome challenges faced in static media digitization. Data analysis for the collected qualitative data revealed of 13 types of suggested solutions. Solutions suggested to *Planning and Workflow* are still the most frequent ones, because this category contains 51 responses. These solutions discuss various aspects related to planning and workflow of the digitization process. For example, S118 said "Training my own staff on productivity, MPLP," which refers to a way of increasing productivity in digitization. Also, S192 referred to different aspects such as implementing quality control, referencing "Frequent training, coaching, feedback, quality checks." S146 said "Improving communication by taking advantage of project management tools," which refers to a solution for facilitating better communication among staff.

Suggested solutions regarding financial issues were addressed as well. *Funding* is a critical aspect of the digitization process, and these types of solutions may refer to advocacy, increasing an annual budget, or seeking grants. For instance, "Identifying grants and other funding sources intended specifically for purchasing and updating digitization equipment" (Unspecified Subject Number), which clarifies how funding is important in obtaining, maintaining and upgrading appropriate digitization hardware/equipment. Another subject mentioned the necessity of investing in different aspects, citing "Investment in infrastructure (staffing, equipment, etc.) to make it possible to incorporate into everyday processing procedures; workflow development" (S218).

A total of 53 responses were coded as suggested solutions regarding staff issues. However, these responses were classified into three sub-categories to attain a more precise analysis: *Staff Availability*, *Staff Awareness and Skills*, and *Staff Time*. Regarding *Staff Awareness and Skills*, a total of 28 responses were coded into this category. For instance, "Having ALL members of the team present during all meetings to avoid delays" (S146), and "Be vigilant. Better communication among staff" (S62). The latter two examples refer to the importance of communication between staff members. Regarding training staff, S224 said "Mandatory group training enforced by management."

Regarding *Staff Availability*, a total of 22 responses were coded into this category. For instance, S162 said "Hiring professional staff," which emphasized the need to employ more staff for digitization. However, S38 mentioned a more detailed solution, specifically to "find dedicated Digital Collections Librarian who can both project manage and promote collections" in referring to the need of employing a staff member to manage specific digitization activities.

Suggested solutions concerning *Storage* is one type of the solutions discovered during data analysis. These solutions were related to many aspects, such as digital preservation, digital repository, and server space. For instance, "More file storage space" (S59), and "Designate server support for digitization and project development" (S105) shows the need for more storage capacity to handle digitization projects. On the other hand, S146 said "Our next huge step is to create a digital preservation policy," which refers to planning and designing for digital preservation.

Subjects provided around 13 solutions suggested for issues related to *Physical Material*. This category focuses on the physical material itself. Solutions coded into this category discussed related aspects such as handling fragile materials, nitrate films, and scanning oversized materials. For example, S94 recommended "Trainings on handling fragile materials and digitizing well the first time" as a solution for appropriate handling and digitizing of fragile materials. Unspecified Subject Number's suggestion was to "develop guidelines/workflows for individual formats" as a way of finding suitable methods to digitize different materials.

Hardware is one of the main categories found during the analysis of the suggested solutions. This type of suggested solution discusses digitization equipment/hardware such as purchasing equipment, suitable equipment for oversized materials, and training staff on hardware. "We can avail ourselves of large format vendors, but would prefer to purchase equipment we can use in-house" (Unspecified Subject Number), indicating that certain equipment for digitizing large format materials is needed. Also, S105 said "Replace old computers, not just scanners and camera stands" in reference to the need for more powerful computers for digitization projects.

A total of 10 responses were coded as suggested solutions related to *Guidelines*. This type of solution discusses issues concerning guidelines such as guidance and making guidelines easier. For instance, "Creation of more user friendly internal guidelines to facilitate better user training" (S58), which explained the need to make internal guidelines easier to understand. Another subject indicated the need for more guidance, stating "Central administration (imaging department) and clear guidance on institutional standards, blended with recognition of departments' particular needs" (S218). Also, Unspecified Subject Number said "identify standards for quality" in reference to the need for adopting quality standards.

During data analysis for suggested solutions, nine responses were coded into the *Software* category. Digitization of static media may require different types of software. For example, "Better library systems software" (S169) emphasizes the importance of having advanced and enhanced computer programs. Also, S47 said "More registration of digitized resources to prevent duplication of effort. More federated sites to promote sophisticated modes of inquiry and access: a shared newspaper site; shared books site (Hathi); shared visual resources site (artSTOR?); shared site for finding aids" as a solution to identify and manage the digitized items.

During data analysis for the collected responses, suggested solutions regarding *Physical Space* were found as well. These solutions referred to the physical place or location. For instance, "There is no additional space in the library. Everything could be solved with a new building or relocation" (S131), which refers to two suggested solutions to address challenge of lack of space. Also, S36 said "Providing additional workspaces for digitization" to emphasize the need for more space to perform digitization projects.

Suggested solutions regarding *Metadata* were also found in the collected data. These solutions discussed aspects related to metadata such as DACS compliance and hiring metadata staff. For instance, "A desired solution would be a way to analyze finding aids to see if they're DACS compliant and they have the same item level description across the entire finding aid" (S16), which clarifies the need for confirming finding aids' compatibility and consistency. Regarding the need for employing specialized staff in metadata, S207 said "Convincing our administration that metadata personnel are needed to insure timely completion of projects."

The *Copyright* category included only three suggested solutions related to the copyright aspect, such as intellectual property rights management. One response mentioned the need for more knowledge and expertise in this field, recommending "Additional legal expertise in intellectual property rights management" (S36). Another referred to the need for more staff training in this area, recommending "training on copyright issues" (S208).

Further, *Staff Time* is the third type of suggested solutions related to staff issues. Based on the collected data, only three responses were coded into this category. For instance, "allow more time for staff to spend on digitization activities" (S117) as a reference to the considerable time needed for these digitization projects. S218 mentioned a solution for a better use of staff time by saying "…cost-benefit analysis, i.e., recognition of the cost of wasted staff time doing processing work because pulling files from the servers/storage space is a glacial process."

4.5.2. Non-static (Audiovisual) Media

Both the electronic questionnaire and semi-structured interviews collected qualitative data regarding the solutions to the challenges encountered in digitization of non-static (audiovisual) media. Collected data were analyzed through an open coding method. The first type of solutions explored were those applied to non-static (audiovisual) media digitization. Table 4.49 shows these types of applied solutions and their definitions:

Table 4.49
Solutions Academic Librarians Applied to Non-static (Audiovisual) Media Digitization

Types of Applied Solutions	Definitions
Funding	Solutions applied to financial issues (e.g., raising funds, purchasing equipment, and seeking grants).
Guidelines	Solutions applied to the issues of guidelines and standards (e.g., decision making and updating the adopted standards).
Hardware	Solutions applied to digitization equipment issues (e.g., outsourcing, providing equipment, and purchasing equipment).
Metadata	Solutions applied to the issues of the descriptive data of a digital object.
Physical Material	Solutions applied to the issues of the tangible media contains information (e.g., 10-inch audio reel player, outsourcing audio digitization, prioritization, and sticky shed syndrome).
Physical Space	Solutions applied to the issues of digitization place or location.
Planning and Workflow	Solutions applied to the issues regarding designing and implementation of the procedures in the digitization process (e.g., documentation, grants writing, outsourcing, prioritization, and quality control).
Software	Solutions applied to the issues of computer programs.

Staff

Staff Availability	Solutions applied to issues regarding staff employment.
Staff Awareness and Skills	Solutions applied to issues regarding staff knowledge and/or expertise (e.g., communication, consulting experts, grants writing awareness, online research, and training program).
Storage	Solutions applied to digital storage issues.
Transcription	Solutions applied to issues regarding creating textual content for the non-static (audiovisual) materials.

Based on the data collected by the electronic questionnaire and the semi-structured interviews, Figure 4.9 shows the frequency of the types of the solutions that were applied by academic librarians to the challenges they faced in digitization of non-static (audiovisual) media:
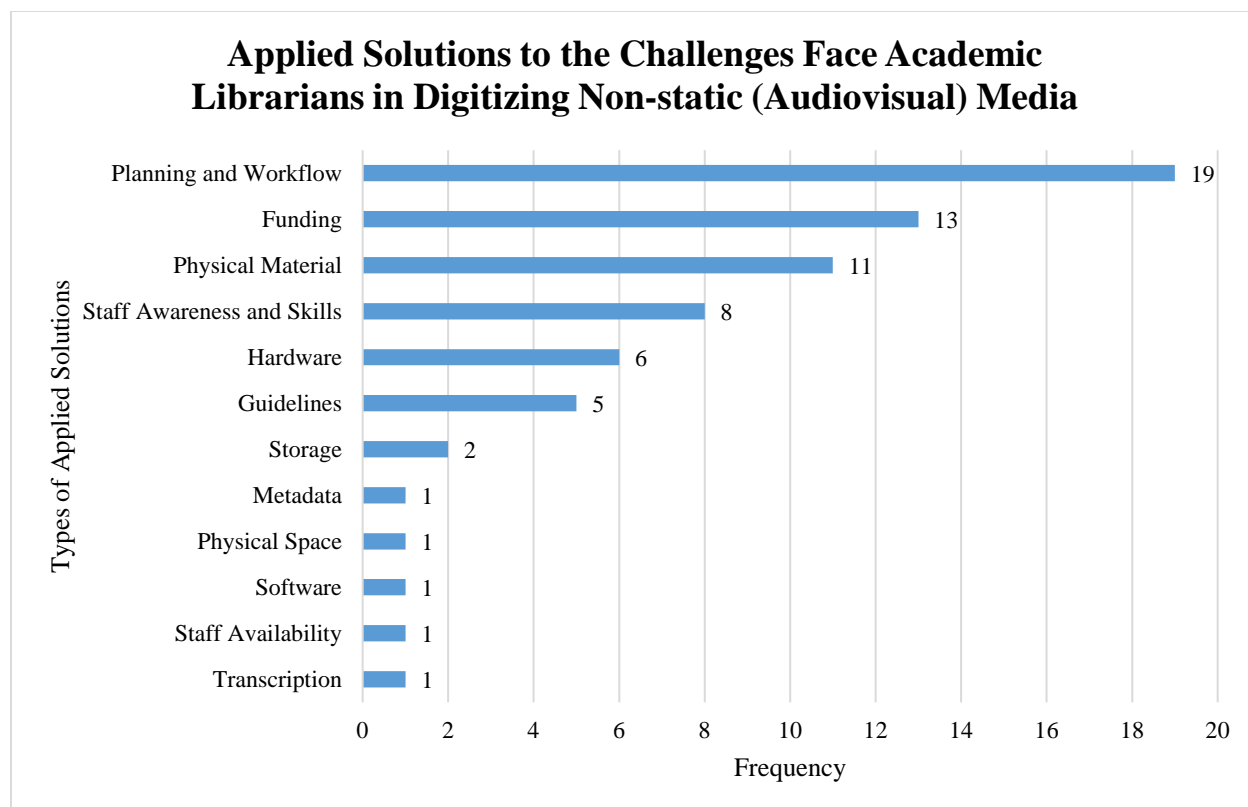
Applied Solutions to the Challenges Face Academic Librarians in Digitizing Non-static (Audiovisual) Media

Figure 4.9 Frequency of the types of solutions applied by academic librarians to overcome the challenges they faced in non-static (audiovisual) media digitization

Data analysis revealed 12 categories of solutions applied for digitizing non-static (audiovisual) media, whereas each category represents a certain type of applied solution. Regarding the applied solutions for non-static (audiovisual) media digitization, *Planning and Workflow* is the largest category explored during open coding. Responses in this category referred to many aspects of the digitization process, such as documentation, outsourcing, prioritization, and quality control. However, outsourcing digitization of non-static (audiovisual) media was very frequent among the responses within this category. Regarding outsourcing digitization of audiovisual materials at the examined libraries, S16 said "…we use commercial digitization companies to do all non-static media." Regarding documentation within digitization

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workflow to have a better management for digitization projects, S215 said "…the other thing that we've done for non-static materials is to create well-documented workflows and inventories to keep track of those digital assets…."

Funding is one of the major categories that was explored. This type of applied solution has many examples such as raising funds and seeking grants. Applied solutions regarding funding may help in different aspects of the digitization process. For instance, "Outside grants have helped with staffing" (S166), which indicates the ways in which grants played a role in hiring staff to deal with digitization. Also, funding helped in other aspects of digitization projects, such as outsourcing. For instance, S107 said "…we've been writing small grants as much as possible in order to try to get the funding in order to outsource the digitization. And we've been fairly successful in obtaining some small grants to do that," illustrating how funding helped in outsourcing digitization.

Collected data revealed solutions applied because of issues caused by the *Physical Material* itself. These applied solutions were related to many aspects such as prioritization, sticky shed syndrome, or digitizing a particular type of media. For instance, "We don't have the equipment to digitized [*sic*] audio material in house so we outsource this" (S117), which shows that the lack of equipment to digitize specific materials like audio was solved by outsourcing the digitization process for that type of material. Regarding sticky shed syndrome, S168 said "…we have so much sticky shed and acetate both magnetic and film actually.…the audio tape, reel tape is so brittle that we were having to slice it almost every foot…" in a reference to a solution that was performed to handle the affected materials by that syndrome.

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A total of nine responses referred to the staff element in the digitization process. These responses indicated solutions that were applied at some point of the process. Based on their themes, they were classified as either *Staff Availability* or *Staff Awareness and Skills*. Responses related to communication, consulting experts, and training programs were coded into the category of *Staff Awareness and Skills*. Regarding consulting experts and staff training as solutions that were applied at the examined libraries, S53 said that "We consult with local experts to gain adequate training for dealing with problem archival AV material." Regarding enhancing and developing staff awareness to seek the needed funding to support digitization, S56 said "…we also sought grant funding although we did not get it, but we did through the awareness of writing the grant…."

Responses related to digitization equipment or *Hardware* were also observed. This type of response referred to the hardware element in the digitization process. For instance, "I bring my own professional equipment. The department doesn't have the resources to purchase said equipment. It's expensive stuff" (S131), which refers to a solution applied to overcome the lack of digitization equipment. Also, S59 said "we do outsource that material because we don't have the equipment here to digitize those items" to clarify that outsourcing digitization of specific materials was an applied solution as a result of lacking the needed hardware. The previous two examples presented the challenge of lack of equipment/hardware; two different solutions were applied.

Applied solutions related to *Guidelines* were also observed during data analysis. These solutions are related to many aspects including decision making and updating the already adopted standards. For instance, S56 said "For video we don't, we haven't found any standards to date, so we just kind try to do our internal best practices" to emphasize that adopting their local

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guidelines solved the problem of not locating video digitization guidelines. Also, S168 said "…we are actually changing those standards more frequently, for example we used to not digitize in SD, we used to digitize only an SD and now we're getting more into HD" to report that updating the adopted standards on a frequent manner was applied as a solution.

Applied solutions related to *Storage* issues were also indicated from the collected responses. These two responses were referring to digital storage. For instance, S107 said "We've got a limited amount of space to store the materials,….we will take down the standards a little bit and not digitize at quite high resolution when we know that the piece in hand is not particularly of high quality" in a reference to handling limitation in storage capacity through adjusting the adopted digitization guidelines based on the materials being digitized.

During the open coding process for the qualitative data, only one response indicated an applied solution to the *Metadata* element in the digitization process of non-static (audiovisual) media. S166 said "…recently started experimenting with OHMS (the oral history metadata synchronizer) and that can actually replace old transcriptions so it can speed up the process…it's like putting timestamps with it into the oral history about where certain thing is discussed instead of doing a full transcription…." This response indicated that metadata issues were also experienced during the digitization process, the solution was using OHMS to solve the metadata issue.

Only one response was found related to *Physical Space* or location of conducting the digitization process. This response explained that a solution was applied to the place dedicated for digitization. "I am in the process of reorganizing our lab…" (Unspecified Subject Number), which refers to organizing and enhancing the physical place or location to digitize materials.

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Digitization of non-static (audiovisual) media incorporates the *Software* element in the process as well. During the open coding process, only one response referred to software as an applied solution that was utilized. S168 said "…we store all of our procedural documentation on Confluence which is a wiki….And the wiki allows us to modify and update as needed, annotate maybe for specific projects, so all of the staff have access to the same documentation." This response shows how adopting a computer program in the digitization process helped in informing staff involved in digitization activities.

Staff Availability is the second type of solution related to the staff element in the digitization projects. This category is focused on staff employment for digitization projects. Only one response was coded into this category. S166 said "Outside grants have helped with staffing," which showed that a solution was applied by hiring the needed staff member(s) to do digitization activities.

Finally, only one applied solution was related to *Transcription*. This solution indicated a type of action taken to solve the problem of creating textual content for non-static (audiovisual) media. S166 said "…recently started experimenting with OHMS (the oral history metadata synchronizer) and that can actually replace old transcriptions so it can speed up the process…it's like putting timestamps with it into the oral history about where certain thing is discussed instead of doing a full transcription…." This shows how a solution was applied to overcome the transcription issue for certain type of materials. Although this quote was coded earlier into the *Metadata* category, it was coded again into this category (i.e., *Transcription*) because it referred to both metadata and transcription aspects.

On the other hand, academic librarians suggested solutions to overcome the challenges faced in digitization of non-static (audiovisual) media. The conducted data analysis for the electronic questionnaire and semi-structured interviews revealed different types of solutions. Table 4.50 shows different types of suggested solutions for digitizing non-static (audiovisual) media and their definitions:

Table 4.50
Solutions Academic Librarians Suggested for Non-static (Audiovisual) Media Digitization

Types of Suggested Solutions	Definitions
Copyright	Solutions suggested for copyright and intellectual property issues.
Funding	Solutions suggested for financial issues (e.g., purchasing equipment and seeking grants).
Guidelines	Solutions suggested for guidelines and standards issues (e.g., guidance and developing standards).
Hardware	Solutions suggested for digitization equipment issues (e.g., purchasing equipment).
Physical Material	Solutions suggested for the issues of tangible media containing information (e.g., deterioration, oversized materials, and VHS).
Physical Space	Solutions suggested for the issues of digitization place or location (e.g., climate control and workstations).
Planning and Workflow	Solutions suggested for issues regarding designing and implementation of procedures in the digitization process (e.g., advocacy, communication, outsourcing, prioritization, and project management).
Software	Solutions suggested for issues of computer programs.
Staff	
Staff Availability	Solutions suggested for issues regarding staff employment.

Staff Awareness and Skills	Solutions suggested for issues regarding staff knowledge and/or expertise (e.g., advocacy, education, patience, and training).
Staff Time	Solutions suggested for issues regarding the time devoted to digitizing non-static (audiovisual) media.
Storage	Solutions suggested for storage issues (e.g., archival storage, checksums, climate control, digital preservation, and digital storage).

Figure 4.10 shows the frequency of the types of the suggested solutions by academic librarians to overcome the challenges encountered in digitization of non-static (audiovisual) media. The frequency was calculated based on the data collected by the electronic questionnaire and semi-structured interviews:
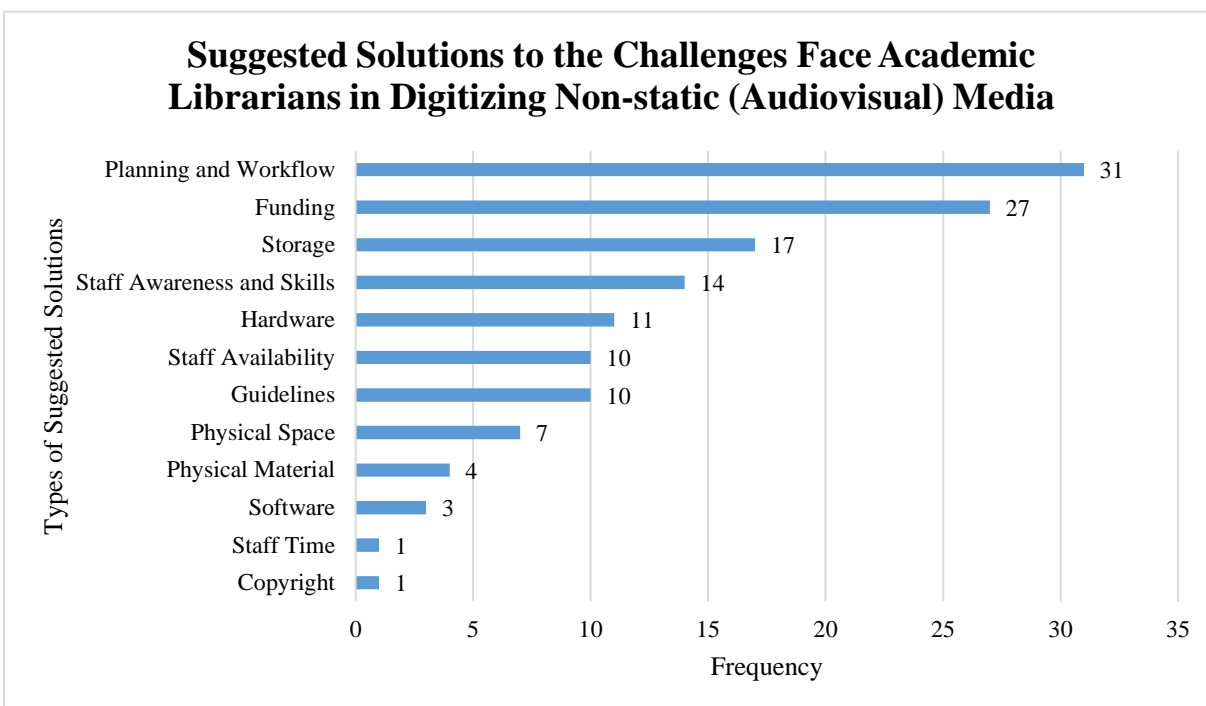

Figure 4.10 Frequency of the types of solutions suggested by academic librarians to overcome the challenges faced in non-static (audiovisual) media digitization

Open coding for the collected data revealed 12 types of suggested solutions regarding digitizing non-static (audiovisual) media. These solutions discussed many aspects related to the digitization process. *Planning and Workflow* is the largest category of suggested solutions based on the frequency of responses. This category discusses different aspects of the digitization process such as advocacy, outsourcing, and project management. For instance, "prioritize non-static material for digitization" (Unspecified Subject Number), which refers to the importance of prioritization in the digitization process. Another example from this category is about planning and implementing digital preservation, S95 said "Working on preservation plan, which includes long-term archival storage." Regarding advocacy for digitizing non-static (audiovisual) media, S3 said "Continued advocacy for audiovisual materials."

Solutions regarding *Funding* were still noted due to the number of suggested solutions. A total of 27 responses were coded into this category. These dealt with different aspects, such as: purchasing equipment, seeking grants, and storage. For instance, Unspecified Subject Number stated "identify funding sources" in a reference to find sources for supporting digitization projects financially. Regarding the need for financial support to provide more storage capacity, S38 said "Continue to request funding for additional server space."

Responses related to *Storage* suggested solutions about two types of storage, digital and physical. These responses reported on many aspects within this context such as archival storage, climate control, and digital preservation. For instance, "Continue to request funding for additional server space" (S38), which refers to the need for more digital storage for digitization

projects. On the other hand, S56 said "…analog audiovisual needs more like cold storage…," referring to physical storage to store physical materials.

Suggested solutions regarding staff were indicated by the collected responses. These were classified into *Staff Availability*, *Staff Awareness and Skills*, and *Staff Time*. *Staff Awareness and Skills* is one of the categories listed under suggested solutions related to staff. A total of 14 responses were coded into this category. These discussed several aspects, such as education, advocacy, training, and knowledge. For instance, S139 said "Seek free online training whenever it is available" to emphasize the importance of staff training to enhance staff knowledge and expertise.

A total of 11 responses were coded into the *Hardware* category. These discussed many aspects regarding this issue such as purchasing equipment. For instance, "Buy more equipment, though this will likely need to come out of external funding sources" (Unspecified Subject Number), which states the need for more digitization hardware to digitize non-static (audiovisual) media. Similarly, another subject mentioned a solution about buying new digitization hardware, S208 said "reviewing options for purchasing new equpment [*sic*]." Also, S58 said "Purchase AV digitization hardware for most common formats (VHS, cassette)" as a solution to overcome hardware challenges in digitizing non-static (audiovisual) media.

The second category concerning staff involved in the digitization process was *Staff Availability*. A total of ten responses were coded into this category. This category focused on staff employment to carry out digitization projects. For instance, S94 said "Hiring more staff/students" as a solution to overcome a shortage of staff members engaged in digitization

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activities. Another subject said "Ability to hire new staff with appropriate skills" (S104), which refers to the need for more staff members with specific expertise and skills.

Suggested solutions related to *Guidelines* were also found during the data analysis process. These responses indicated different aspects related to the guidelines themselves. For instance, "develop digitization standards" (Unspecified Subject Number), suggesting a solution referring to the creation of digitization guidelines. Another subject suggested that guidelines need to take into consideration limitations in storage capacity for audiovisual materials, stating that "…a more realistic understanding of what the storage capacity is, and the and the ability to really manage digital, non-or non-static media because the storage size for those materials can be you know extraordinarily large which also makes it difficult to manage that size of a file on regular computers…" (S215).

A total of seven responses were coded into the *Physical Space* category. These indicated suggested solutions to overcome the issues faced in dealing with physical space or places, such as climate control and workstations. For example, "…I also wish that we had better climate control, so that we could hold these objects better…" (S107), referring to the need for an enhanced climate control system. Also, S56 said "…analog audiovisual needs more like cold storage…," which refers to a certain type of storage for keeping and storing non-static (audiovisual) media.

Suggested solutions related to *Physical Material* selected for digitization were observed. This category focuses on the physical material itself, and suggested solutions related to this aspect. Collected responses discussed different aspects such as deterioration, oversized materials, and VHS. For instance, S139 said "Keep original materials stored under climate-controlled

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conditions to halt or slow further deterioration," in reference to a solution for addressing

deterioration of physical material. Regarding buying digitization equipment for specific

materials, S58 said "Purchase AV digitization hardware for most common formats (VHS,

cassette)."

Solutions were suggested to overcome challenges faced around *Software* incorporated in

the digitization process. This category contains only three responses that discussed this aspect.

For example, S59 referred to the need for a computer program to manage and organize the

digitization process, stating "We would like to have a digitization workflow tool, so some type of

a software system that allows us to manage the items that are coming in and the tasks that have

to be done and allows us to be able to track where things are in the process, and provide

statistics." Moreover, S215 said "I don't think I'd I'd ever want to go to in-house digitization of

non-static media. We don't have the enough inventory to make that. You know, MAM a

reasonable solution so I think we actually have arrived at a pretty good solution…," which

indicated using a computer program for the digitization process.

Only one response was coded into the *Staff Time* category. This is the third and last

category related to staff. S218 said "…cost-benefit analysis, i.e., recognition of the cost of

wasted staff time doing processing work because pulling files from the servers/storage space is a

glacial process," which shows a solution to avoid wasting staff time.

The last type of suggested solutions concerns *Copyright*. This category is related to the

aspect of copyright and intellectual property. Only one response was coded into this category.

S16 said "None, except to digitize old items and educate curators on the loopholes to the Sonny

Bono law," a reference to enhance staff awareness and knowledge about this copyright law.

4.6. Chapter Summary

The following paragraphs briefly discuss the five research questions and some of their significant findings.

Adopted digitization guidelines and compliance

Answering this research question depended on the collected data from the three data collection techniques (i.e., document analysis, electronic questionnaire, and semi-structured interviews). The explored results were reported in two major sections, which are *Data from Guidelines (Document Analysis)* (Section 4.1.1.) and *Data from Practitioners (Electronic Questionnaire and Interviews)* (Section 4.1.2.). This separation of results helped in exploring and realizing the differences between the theoretical and practical aspects of the digitization process.

Differences were noticed among the analyzed digitization guidelines in many aspects, such as their contents and technical specifications. It was noticed that different digitization guidelines were adopted by the investigated academic libraries to digitize static and non-static (audiovisual) media. Also, differences were noticed in the reported percentages of technical specifications found on the adopted digitization guidelines.

Compliance levels with the adopted digitization guidelines were reported by the subjects for static and non-static (audiovisual) media. A noticeable variation was recognized in these reported levels. However, the option "University's own customized digitization guidelines"

received the greatest means' scores among the other options in both contexts (i.e., static and non-static [audiovisual] media). The two most frequent types of reasons for compliance within the contexts of static and non-static (audiovisual) media were related to *Consistency, Standardization, and Sustainability* and *Access and Preservation*. On other hand, the two most frequent types of reasons for not complying with digitization guidelines were *Planning and Workflow* and *Hardware* for static media, whereas *Hardware* and *Staff Awareness and Skills* were identified this way for non-static (audiovisual) media.

Differences in compliance with the static and non-static (audiovisual) media digitization guidelines

Only digitization guidelines occurring within the sections of static and non-static (audiovisual) media in the electronic questionnaire were examined quantitatively. A total of three digitization guidelines (i.e., ALCTS, consortium/consortia digitization guidelines, and a university's own customized digitization guidelines) were included in the statistical analyses. The Paired Samples Test and Wilcoxon Signed Ranks Test were selected for the collected quantitative data to compare levels of compliance, availability, and usefulness.

A total of two Paired Samples Tests and seven Wilcoxon Signed Ranks Tests were conducted to explore the differences of these levels between static and non-static (audiovisual) media. The results of the Paired Samples Tests and Wilcoxon Signed Ranks Tests for these three guidelines reported no significant differences between static and non-static (audiovisual) media regarding compliance, availability, and usefulness.

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Challenges face digitization of static and non-static (audiovisual) media

Quantitative data in the form of agreement levels (a 7-point Likert scale) regarding six statements (i.e., budget, external funding, digitization equipment/hardware, digitization software, staff digitization skills, and the need for more professional training on digitization) were collected through the electronic questionnaire. The first two statements (i.e., statements about budget and external funding) in the tables of the agreement levels (Tables 4.32 and 4.34) have the lowest mean scores among the entire statements. This shows the significant impact of financial issues on digitization of static and non-static (audiovisual) media. Lower means' scores were reported for the third, fourth, and fifth statements (i.e., digitization equipment/hardware, digitization software, and staff digitization skills) within the context of non-static (audiovisual) media comparing to static media. The statement regarding staff need for more professional training on digitization skills received a higher mean score within the context of non-static (audiovisual) media comparing to static media.

Qualitative data were collected through the electronic questionnaire and semi-structured interviews to answer this research question. Open coding was applied to explore the types of challenges reported by the collected responses. Most of these types were found within the contexts of static and non-static (audiovisual) media. The three most frequent types of challenges for static media digitization were: *Planning and Workflow*, *Funding*, and *Hardware*. However, the three most frequent types of challenges for non-static (audiovisual) media digitization were: *Hardware*, *Funding*, and *Staff Awareness and Skill*.

Differences in challenges facing digitization of static and non-static (audiovisual) media

This research question draws a comparison of the challenges that face academic libraries between digitizing static and non-static (audiovisual) media. Six statements were designed in a 7-point Likert scale to estimate agreement levels between static and non-static (audiovisual) media digitization. These aspects are: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4) digitization software, 5) staff digitization skills, and 6) the need for more professional training on digitization.

The Wilcoxon Signed Ranks Test was applied for these statements to explore differences. A total of six Wilcoxon Signed Ranks Tests were applied to compare one statement in the context of static media to its equivalent in the context of non-static (audiovisual) media. For example, the statement regarding budget within the context of static media was compared to its equivalent in the context of non-static (audiovisual) media. Based on the conducted tests, five null hypotheses were rejected (i.e., 4.1, 4.3, 4.4, 4.5, and 4.6). However, hypothesis 4.2 was not rejected. This shows that there were significant differences (except to hypothesis 4.2) between digitization of static and non-static (audiovisual) media.

Applied or suggested solutions to overcome these challenges

Exploring solutions to the encountered digitization challenges plays a main role in enhancing the digitization process in general. This doctoral dissertation explored different types of digitization challenges encountered by academic libraries in digitizing static and non-static

(audiovisual) media. Therefore, solutions to overcome such challenges were collected from the subjects through the electronic questionnaire and semi-structured interviews.

The collected qualitative data regarding solutions for digitization of static and non-static (audiovisual) media were classified as applied or suggested solutions (Sections 4.5.1. and 4.5.2.). Applied solutions refer to those already applied to overcome the encountered challenges, whereas suggested ones refer to desired solutions that have not yet applied. It was found that responses including solutions related to *Planning and Workflow* and *Funding* were the most two frequent types of applied and suggested solutions to static and non-static (audiovisual) media digitization.

Chapter 5 Discussion

Digitization of static and non-static (audiovisual) media at academic libraries in the United States is the main theme of this doctoral dissertation. Exploring related themes (e.g., digitization guidelines, compliance with the adopted digitization guidelines, and encountered challenges) helps in building a proper understanding about digitization of materials at academic libraries. Based on the results obtained from this study (Chapter 4 Results), three types of implications were realized. The following sections (Sections 5.1.-5.3.) discuss the theoretical, practical, and methodological implications for this study.

5.1. Theoretical Implications

Theoretical implications of this doctoral dissertation deal with *Digitization Guidelines and Compliance* (Section 5.1.1.), and *Digitization Challenges* (Section 5.1.2.). Analyzed data helped in understanding the most commonly adopted digitization guidelines in the area of academic libraries. Compliance levels with the selected digitization guidelines for static and non-static (audiovisual) media were examined as well. This examination was revealing in gaining a greater understanding of the reasons of complying and not complying with selected digitization guidelines. These theoretical implications offered insights for practical implications as well (Section 5.2.).

5.1.1. Digitization Guidelines and Compliance

A digitization plan could be the first step in starting a digitization project. The *IFLA/UNESCO Survey on Digitisation and Preservation* by Ebdon et al. (1999) examined libraries worldwide (including national, university, governmental libraries and archives) regarding digitization programs and policy; they found that 48% of them have a program to digitize collections, whereas 52% do not have such a program. Also, The Institute of Museum and Library Services (2006) reported many hindrances to digitization activities in academic libraries such as the lack of having established: digitization plans, digitization policies, and quality standards. The results reported in this doctoral dissertation (Section 4.1.2.) indicated that only 54.41% of the responses mentioned that their universities have digitization plans, 27.94% do not have such plans, and 10.29% do not know.

This doctoral dissertation found that lack of a digitization plan is still significant within the context of academic libraries. Although 54.41% is more than the half of the examined sample for this dissertation, it is still considered a serious challenge concerning availability of a digitization plan to guide digitization projects. Document analysis for the 12 digitization plans uploaded to the electronic questionnaire by the subjects revealed that these plans differ in structure, contents, and level of detail.

Academic libraries are digitizing different materials. This study (Section 4.1.2.) found that the most three prioritized items for digitization are: 1) photographs, 2) manuscripts, and 3) rare books. The survey by Ebdon et al. (1999) investigated the types of documents that are being digitized and the percentage of the examined libraries or archives digitizing those documents, concluding that the most three digitized materials are: rare books (49%), photographs (44%), and

manuscripts (39%). Hence, the top three selected items for digitization reported in this doctoral

dissertation and the survey by Ebdon et al. (1999) are similar regardless of their order. However,

The Institute of Museum and Library Services (2006) mentioned that the three highest

digitization priorities are: historical documents or archives as a top priority to 38.7% of the

surveyed academic libraries, course material as a top priority to 33.9% of them, and photographs

prioritized by 24.2% of them. However, the electronic questionnaire used in this doctoral

dissertation (i.e., Question 13) didn't use the term "historical," so it is not clear during data

analysis whether respondents were referring to historical manuscripts and rare books in the

process of answering this question.

The main scope of this dissertation examined digitization of static and non-static

(audiovisual) media at academic libraries in the United States. The selected sample for this

doctoral dissertation consisted of doctoral universities only with highest and higher research

activity based on the 2015 classification issued by The Carnegie Classification of Institutions of

Higher Education. This dissertation focused on different angles regarding digitization guidelines,

such as: the most frequently adopted guidelines, and additionally levels of and reasons for

compliance, availability, and usefulness. The significance of this doctoral dissertation lies in the

exploration of the adopted digitization guidelines by academic libraries in the United States, as

well as levels of and reasons for compliance, availability, and usefulness.

Further significant contribution of this doctoral dissertation is the comparison element,

which focuses on comparing the adopted digitization guidelines between static and non-static

(audiovisual) media within the context of academic libraries. Levels of compliance, availability,

and usefulness were compared between static and non-static (audiovisual) media as well. The

collected data for this doctoral dissertation reported many significant findings related to the

digitization guidelines and compliance with those guidelines. The following paragraphs in this section report some of the key findings.

The digitization guidelines adopted for static and non-static (audiovisual) media varied as indicated from the results. Certain types of digitization guidelines were more frequently adopted by the examined sample. University, FADGI and NARA digitization guidelines were the three most frequently adopted for static media (Table 4.8), whereas university, other, and IASA digitization guidelines were the three most frequently adopted for digitizing non-static (audiovisual) media (Table 4.15). This shows that university digitization guidelines occurred among the top three selected by subjects for both static and non-static (audiovisual) media.

Compliance levels for the selected digitization guidelines were analyzed statistically. Paired Samples Test or Wilcoxon Signed Ranks Test outcomes were calculated for the three digitization guidelines (i.e., ALCTS, consortium/consortia, and university) referenced in the previous chapter (Section 4.2.1.). No significant differences were found in the compliance levels for these digitization guidelines between static and non-static (audiovisual) media.

Similarities were found among types of reasons for compliance with the selected digitization guidelines between static and non-static (audiovisual) media (Tables 4.11 and 4.19). Only six types of reasons occurred in both contexts: 1) *Access and Preservation*, 2) *Consistency, Standardization, and Sustainability*, 3) *Guidelines*, 4) *Hardware*, 5) *Planning and Workflow*, and 6) *Staff Awareness and Skills*.

The frequency of each type of compliance reasons category was calculated for static and non-static (audiovisual) media (Figures 4.1 and 4.3). The *Consistency, Standardization, and Sustainability* category ranked first in the contexts of static and non-static (audiovisual) media,

whereas the *Access and Preservation* category ranked second in both contexts. The *Staff Awareness and Skills* category ranked third for static media, while it was ranked fifth for non-static (audiovisual) media. Reported compliance reasons by subjects for static and non-static (audiovisual) media (Sections 4.1.2.1. and 4.1.2.2.) addressed relatively similar aspects such as consistency, digital preservation, and following experts' recommendations.

On the other hand, types of reasons for not complying with the selected digitization guidelines were almost similar between static and non-static (audiovisual) media. However, *Copyright* and *Metadata* types of reasons for non-compliance existed only in the static media context. Regarding the frequency of types of reasons for not complying with the selected digitization guidelines (Figures 4.2 and 4.4), it was found that *Hardware* and *Staff Awareness and Skills* were among the top three categories for static and non-static (audiovisual) media. Based on the frequency for each type of reasons, it was found that the *Hardware* category ranked second for static media, but first for non-static (audiovisual) media. The *Staff Awareness and Skills* category ranked third for static media, whereas it ranked second for non-static (audiovisual) media. Reported reasons for not complying with digitization guidelines by the subjects (Sections 4.1.2.1. and 4.1.2.2.) for static and non-static (audiovisual) media for these two categories (i.e., *Hardware* and *Staff Awareness and Skills*) were similar, such as the lack of appropriate hardware/equipment and staff knowledge. This might indicate that reasons related to hardware/equipment (i.e., *Hardware*) and staff knowledge (i.e., *Staff Awareness and Skills*) could be considered as main barriers to comply with digitization guidelines.

5.1.2. Digitization Challenges

Many studies discussed funding within the digitization context (Conway, 1994; Lampert & Vaughan, 2009; Maroso, 2005; The Institute of Museum and Library Services, 2006). Funding issues affect many aspects related to the digitization process at academic libraries. The Institute of Museum and Library Services (2006) reported that the lack of both staff time and funding were indicated as examples of the greatest obstacles face digitization by academic libraries. Also, Conway (1994) mentioned that digital imaging technology needs continuous funding to support many aspects such as additional storage capacity and the necessary labor. This doctoral dissertation reported funding challenges in academic libraries' efforts to digitize static and non-static (audiovisual) media. Reported results (Sections 4.3.1. and 4.3.2.) in this doctoral dissertation indicated that funding challenges ranked second based on the frequency of collected responses within the contexts of digitizing static and non-static (audiovisual) media. Both tables illustrating the types of challenges (Tables 4.33 and 4.35) mentioned the effect of funding on storage as well. This confirms what was mentioned by Potter and Holley (2010) that costs or fees for computer storage are created by digitization.

This doctoral dissertation (Section 4.1.2.2.) found that 52.94% of universities examined digitize non-static (audiovisual) media (e.g., voice recordings and analog videos) based on collected responses from the subjects. A survey by Ebdon et al. (1999) reported that 50% of examined libraries or archives digitize sound recordings, whereas only 25% of examined libraries or archives digitize film or video. This doctoral dissertation did not ask about the digitization of audio and video/film separately in the electronic questionnaire, but it is assumed that the 52.94% includes audiovisual materials such as voice recordings and/or analog videos. Although these two studies differ in their contexts, the results reported in this doctoral

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dissertation show a significant increase in digitizing non-static (audiovisual) media at academic libraries.

Academic libraries may face challenges related to technological issues. These can refer to any technology-related aspect, such as hardware and software. The lack of adequate equipment and/or software is one of the obstacles to digitization activities in academic libraries (The Institute of Museum and Library Services, 2006). This doctoral dissertation reported challenges related to digitization hardware/equipment and software faced in digitization of static and non-static (audiovisual) media at academic libraries. Findings of this doctoral dissertation revealed the existence of these types of challenges within both contexts (i.e., static and non-static [audiovisual] media).

Descriptive Analyses reported on in this doctoral dissertation for agreement levels in Tables 4.32 and 4.34 reflected different means for statements about digitization hardware (i.e., "University has appropriate digitization equipment/hardware for digitizing static media" and "University has appropriate digitization equipment/hardware for digitizing non-static (audiovisual) media"). It was realized that the statement regarding digitization equipment/hardware for static media received a higher agreement level ($M = 4.85$) than the level ($M = 2.60$) for non-static (audiovisual) media.

Similarly, agreement levels for statements about software (i.e., "University has appropriate digitization software for digitizing static media" and "University has appropriate digitization software for digitizing non-static (audiovisual) media") in Tables 4.32 and 4.34 have different means. The mean of the agreement level ($M = 5.22$) of the statement about digitization

software for static media was higher than the mean of agreement level ($M = 3.26$) for non-static (audiovisual) media.

Statistical analyses (Section 4.4.) indicated significant differences of digitization hardware/equipment and software between static and non-static (audiovisual) media (Tables 4.39-4.42). Regarding digitization hardware, the reported means by the Wilcoxon Signed Ranks Test for digitization equipment/hardware in Table 4.39 stated a higher mean for static media ($M = 4.71$) than the mean for non-static (audiovisual) media ($M = 2.60$). Therefore, a statistically significant difference in the agreement levels was found between static and non-static (audiovisual) media according to Table 4.40 (z$= -4.545, p = .000$).

Likewise, the conducted Wilcoxon Signed Ranks Test for digitization software (Tables 4.41 and 4.42) showed a difference between static and non-static (audiovisual) media. Table 4.41 reflected a higher mean for digitization software of static media ($M = 5.06$) as compared to the non-static (audiovisual) media ($M = 3.21$). Hence, Table 4.42 of the Wilcoxon Signed Ranks Test revealed a statistically significant difference between static and non-static (audiovisual) media regarding digitization software ($z = -4.485, p = .000$).

Collected qualitative data for this doctoral dissertation reported types of challenges related to digitization hardware and software (Sections 4.3.1. and 4.3.2.), as well as their frequencies. *Hardware* category is one type of the challenges discovered. Figures 4.5 and 4.6 stated that this category (i.e., *Hardware*) was ranked third for static media, whereas it was ranked first for non-static (audiovisual) media. This might imply that digitization challenges concerning hardware/equipment have a more negative impact on digitizing non-static (audiovisual) media as compared to static media. However, the *Software* category was ranked sixth for static media

based on the frequency of collected responses, whereas it was ranked ninth for non-static (audiovisual) media. Descriptive analysis (Sections 4.1.2.1. and 4.1.2.2.) revealed that 64 subjects (94.12%) indicated that their universities digitize static media, whereas only 36 subjects (52.94%) reported digitizing non-static (audiovisual) media. Since static media is digitized by more universities, this might explain the reason behind ranking *Software* challenge higher for static media than non-static (audiovisual) media.

Qualitative data in Tables 4.33 and 4.35 confirmed the existence of digitization challenges related to hardware and software for digitizing static and non-static (audiovisual) media. Moreover, descriptive and statistical analyses (i.e., the Wilcoxon Signed Ranks Tests) about digitization equipment/hardware and software confirmed differences between static and non-static (audiovisual) media. Based on both types of analyses (i.e., descriptive and statistical), digitization equipment/hardware and software represent more serious challenges in digitizing non-static (audiovisual) media as compared to static media. Both applied and suggested solutions in the fourth chapter of this doctoral dissertation (Sections 4.5.1. and 4.5.2.) discussed the hardware/equipment and software aspects. Although a limited number of solutions were mentioned in both sections, they might assist in providing some insights for dealing with such challenges (i.e., *Hardware* and *Software*).

The availability of staff dedicated to digitization projects is very important. Lampert and Vaughan's study (2009) found that lack of enough staffing was the most common response received for the survey question about the biggest challenge facing the digitization program at the respondents' institutions. This doctoral dissertation reported three types of challenges related to staff involved in digitization based on Tables 4.33 and 4.35, which are: *Staff Availability*, *Staff Awareness and Skills*, and *Staff Time*. These were found in digitizing static and non-static

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(audiovisual) media. The *Staff Availability* challenge is about staff presence and/or their employment for digitization projects.

Moreover, the frequencies of responses concerning *Staff Availability* (Figures 4.5 and 4.6) were calculated for both static and non-static (audiovisual) media. The *Staff Availability* category regarding digitization challenges was ranked fourth for static media, whereas it was ranked eighth for non-static (audiovisual) media. On the other hand, suggested solutions by academic librarians in Tables 4.48 and 4.50 included *Staff Availability* categories. Responses collected from subjects (Sections 4.5.1. and 4.5.2.) concerning suggested solutions revealed the need to hire more staff for digitization projects in both contexts (i.e., static and non-static [audiovisual] media). This confirms that having enough staff to perform digitization projects is still a serious challenge.

According to this doctoral dissertation, it was realized that *Staff Awareness and Skills* was the third most frequent type of challenge for non-static (audiovisual) media (Figure 4.6). Furthermore, results from the statistical analysis (Tables 4.43 and 4.44) showed a serious challenge regarding staff skills in digitizing non-static (audiovisual) media as compared to static media. Hence, results of the statistical analysis (Tables 4.45 and 4.46) reported a significant need for more professional training on digitization to digitize non-static (audiovisual) media. Maroso (2005) concluded that training should not be limited to digital imaging only, but that there is a need to provide training on converting audio and video. Similarly, the findings of this doctoral dissertation indicate that digitizing non-static (audiovisual) media is still a challenging domain for staff, and more professional training is needed to enhance staff skills in digitizing non-static (audiovisual) media.

This doctoral dissertation closely examined digitization challenges that face academic librarians in digitizing static and non-static (audiovisual) media. The qualitative results (Sections 4.3.1. and 4.3.2.) reported many different types of digitization challenges. Static and non-static (audiovisual) media share the same types of digitization challenges, with the exception of *Transcription,* which was reported only for non-static (audiovisual) media. Since this is a comparative study, comparisons were drawn between six statements regarding different aspects of the digitization process (Section 4.4.). Agreement levels assigned to the six statements about the challenges of digitization in the electronic questionnaire (i.e., questions 26 and 41) were analyzed statistically. The Wilcoxon Signed Ranks Tests showed that there are significant differences between digitizing static and non-static (audiovisual) media in terms of: budget (Tables 4.36 and 4.37), digitization equipment/hardware (Tables 4.39 and 4.40), digitization software (Tables 4.41 and 4.42), staff digitization skills (Tables 4.43 and 4.44), and the need for more professional training on digitization (Tables 4.45 and 4.46). However, the Wilcoxon Signed Ranks Test did not show a significant difference between digitizing static and non-static (audiovisual) media regarding external funding (Tables 4.38).

Again, the Wilcoxon Signed Ranks Tests were conducted for these five aspects: 1) budget (Tables 4.36 and 4.37), 2) digitization equipment/hardware (Tables 4.39 and 4.40), 3) digitization software (Tables 4.41 and 4.42), 4) staff digitization skills (Tables 4.43 and 4.44), and 5) the need for more professional training on digitization (Tables 4.45 and 4.46). Except for the aspect of the need for more professional training on digitization, statistical analyses (Tables 4.36, 4.39, 4.41, and 4.43) for the remaining four aspects revealed that agreement levels of the calculated means for static media have higher means as compared to non-static (audiovisual) media. Statistical analysis regarding the need for more professional training on digitization

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(Table 4.45) has a higher mean for the agreement levels of non-static (audiovisual) media as compared to static media. This may imply that digitization of non-static (audiovisual) media is more difficult compared to digitizing static media within the context of the examined academic libraries.

Only one aspect did not show a statistically significant difference between static and non-static (audiovisual) media based on the Wilcoxon Signed Ranks Test (Table 4.38). This was adequate funding from external sources for digitization projects. Regarding external funding, descriptive analyses (Tables 4.32 and 4.34) reflected the lowest mean scores for static ($M = 2.72$) and non-static (audiovisual) media ($M = 2.06$) among other statements in both tables. These results may imply a low agreement level concerning funding from external sources regarding digitization projects of static and non-static (audiovisual) media.

5.2. Practical Implications

Practical implications derived from this doctoral dissertation contain two dimensions based on the analysis of the collected data. The first dimension is providing suggestions and insights to enhance the design of digitization guidelines; the second is reducing the effect of digitization challenges. The following two sections (Sections 5.2.1. and 5.2.2.) discuss these two practical implications in further details.

5.2.1. Enhancing the Design of the Digitization Guidelines

The designs of the digitization guidelines were closely examined during document analysis conducted for this doctoral dissertation. Document Analysis for the five digitization guidelines (Sections 4.1.1.1.-4.1.1.3.) and the 12 digitization plans uploaded by the subjects into the electronic questionnaire (Section 4.1.2.) revealed that there is a lack of a unified design among these guidelines. Although subjects reported on various digitization guidelines adopted by their universities, this section might help in general to enhance digitization guidelines through providing insights that could inform their design. The following suggestions and insights might be limited, as they were produced based on the data analysis performed within the context of this study.

There were differences in the terminology used for the titles of the analyzed digitization guidelines. Terms like "guidelines" and "best practices" were used to refer to these documents. Selecting a term to be used in the titles of the documents of these digitization guidelines based on their contents (e.g., static or non-static [audiovisual] media) or contexts (e.g., academic libraries) might help in achieving greater consistency regarding the terminology used. Consistent terminology should be used for titles of these documents, as well as for their contents. This might be helpful in locating and understating these digitization guidelines, especially by non-experts in this area.

Digitization guidelines varied in their contents, from discussing only the technical specifications to more topics regarding pre-digitization and/or post-digitization activities (e.g., selection or metadata). Further, some digitization guidelines provided references/resources to other information sources. Some of these topics or sections in the digitization guidelines might

be more important than others. The importance of these sections might be determined according to many considerations (e.g., goals of the digitization project, digitized materials…etc.). Creating a basic design for digitization guidelines may help in enhancing them to ensure that the minimum amount of important information is available.

Again, the designs and contents of digitization guidelines may differ based on several factors such as, but not limited to, goals of the digitization projects or digitized materials. Based on the scope of this doctoral dissertation and the conducted document analysis, it is recommended to include main sections in digitization guidelines. Suggested main sections could be: 1) definitions or glossaries for the used technical terms, 2) an explanation of the digitization concept and related technical specifications, 3) suggested technical specifications and file formats for each type of material, 4) a suggested digitization workflow, 5) file naming conventions, 6) metadata, 7) quality control, and 8) helpful resources.

It is suggested that this basic design should define the most important sections essential for inclusion in any digitization guidelines' document. Other sections might be supplementary or optional. These supplementary sections might be included or excluded based on the objectives or goals of the digitization project(s). Also, it is suggested to provide simpler language and explanations/clarifications (e.g., list of terminologies or the concept of a topic) in each needed section of these guidelines. This might help to make digitization information easier to understand by readers. Additionally, using different ways for displaying digitization information (e.g., charts and figures) instead of plain text may help in providing more clarification regarding the topics discussed.

Paying attention to the type of media in designing these digitization guidelines is important. Creating a basic design for digitization guidelines of static media and another for non-static (audiovisual) media could be helpful. These designs may specify the basic and optional contents/sections for digitization guidelines based on nature of the material (i.e., static and non-static [audiovisual] media). The collected data revealed that there is a serious challenge concerning digitization guidelines of non-static (audiovisual) media. Understanding the nature of audiovisual materials is more challenging as compared to static material. Therefore, a careful explanation for this type of materials and associated digitization recommendations might be helpful in enhancing readers' perceptions regarding digitizing these types of materials. Also, digitization guidelines may refer to optional training tutorials, lessons, or sources to explain the digitization process, particularly digitizing complex types of media (e.g., video, film, and oversized materials). These might help in enhancing the application of these digitization guidelines more easily and successfully.

5.2.2. Reducing Digitization Challenges

Digitization is an activity not limited to a single, rather, different aspects and actions are incorporated together in order to have an item be digitized. Specific preparations, actions, and skills are needed to digitize materials successfully. These preparations, actions, and skills might differ according to the nature of the materials (i.e., static and non-static [audiovisual] media) selected for digitization. Different types of challenges may occur at any step of the digitization process, including copyright, funding, guidelines, staff awareness and skills, and storage (See Sections 4.3. and 4.4. for more digitization challenges).

This doctoral dissertation explored many challenges that academic librarians encounter in digitizing static and non-static (audiovisual) media at academic libraries. Quantitative and qualitative analyses revealed many types of these challenges, as well as their frequencies. Based on the collected and analyzed data for this study, this section (Section 5.2.2.) provides suggestions on how to reduce some of these challenges and their impacts on the digitization process.

This doctoral dissertation reported different types of challenges that face academic librarians in digitizing static and non-static (audiovisual) media. Challenges may refer to different aspects, such as budget, funding, equipment/hardware, software, staff digitization skills, copyright, physical material, transcription, and storage. Awareness of these different types of challenges may help in making better preparations for the future digitization projects. This may help during the planning stages in being attentive to some of these challenges and of the solutions needed to be applied.

The need for careful and thoughtful planning is one suggestion to reduce digitization challenges. This demands a realistic understanding of the current environment and situation in the academic library. It means being aware of what is available and/or needed for establishing a successful digitization project. This includes knowledge of and familiarity with the materials owned by the academic library, determining the materials that are worth being digitized, and deciding whether prioritization is needed or not. Based on this awareness, a digitization plan might be prepared. Important aspects should be considered in the planning stage, such as realistic goals, types of materials selected for digitization, clear and detailed steps, and a proposed timeline for each step/phase. Careful planning helps in providing clear guidance for staff involved in the digitization process. It is suggested that the proposed digitization plan clearly

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discusses all important aspects of the digitization process, such as selection, prioritization, scanning recommendations, file naming, metadata, quality control, and storage. Such guidance may help in avoiding any future challenges and speeding up the digitization process.

Applied and suggested solutions (Sections 4.5.1. and 4.5.2.) were discussed to overcome challenges faced in digitization of static and non-static (audiovisual) media. Solutions were classified either as applied or suggested in order to differentiate between already applied and desired solutions. These solutions might provide useful insights for academic libraries facing similar challenges. Applied solutions at one academic library could be considered as suggested solutions for another. Also, suggested solutions might be considered and discussed as to whether they could be helpful or not if applied.

Funding issues for digitization projects is one of the key findings of this doctoral dissertation (Sections 4.3.1., 4.3.2., and 4.4.). It was realized that financial issues affect other aspects of the digitization process, such as hardware, staff training and employment, storage, and transcription. Financial issues may result in challenges or limitations that affect digitization projects. Therefore, finding appropriate solutions, either to reduce or avoid the funding challenge may help in having successful digitization projects. One of the solutions suggested is to seek funding from the administration of the academic library by explaining the importance of the digitization project, providing a detailed plan and goals, and reasons for seeking more funding. Another suggested solution is seeking external funding and grants from sources interested in digitization other than the university itself in order support digitization projects at academic libraries.

Another suggestion is related to staff skills needed for digitization projects. These projects may deal with different materials, such as rare books, photographs, maps, video, audio, oversized documents, and three-dimensional objects. The skills required to digitize each type of these materials might differ widely, since digitizing some materials could be simpler than others. The results reported in this study (Sections 4.3.1., 4.3.2., and 4.4) show issues related to staff training. Providing adequate staff training on digitization may help in improving staff awareness, knowledge, and skills regarding digitizing materials. Also, training programs on digitization could improve the digitization projects and/or overcome some of the current challenges. The nature (e.g., conferences, lectures, onsite courses, online learning, seminars, training sessions, and workshops) and topics of these training programs on digitization for library staff could be defined based on the need(s) of each academic library or digitization project.

5.3. Methodological Implications

This doctoral dissertation examines major themes concerning digitization of static and non-static (audiovisual) media within the context of academic libraries in the United States. One of the major themes is exploring the digitization guidelines adopted by these academic libraries and their compliance level with these chosen guidelines. Another major theme is exploring the challenges that academic libraries are facing in digitizing both types of media, as well as applied and suggested solutions. Further, comparing the results of different aspects regarding digitization of static and non-static (audiovisual) media is another major theme. Studying these interrelated themes related to digitization facilitated a more comprehensive understating.

This doctoral dissertation follows a mixed methods research design; specifically the explanatory design. Selecting subjects was based on purposive sampling for both quantitative and qualitative phases to obtain more accurate findings. Both quantitative and qualitative techniques for data collection and analyses were adopted on a sequential basis. Quantitative data were collected and then analyzed in the first phase of the study, whereas the second phase dealt with collecting and analyzing qualitative data. However, document analysis of five digitization guidelines (a total of nine documents) was conducted prior to starting both quantitative and qualitative phases, which helped in preparing for the questions on the electronic questionnaire.

The electronic questionnaire was a powerful tool in collecting quantitative data from distant subjects. Analyzing this type of data helped in understanding the general status of digitization, as well designing the interview questions to collect more in-depth data. Semi-structured interviews added a second layer of clarification to the preliminary findings of the quantitative phase. It was found that the qualitative phase supported the quantitative phase and added more depth to the final results, because many themes were investigated through the electronic questionnaire and semi-structured interviews.

This doctoral dissertation applied triangulation through the use of three data collection techniques: document analysis, electronic questionnaire, and semi-structured interviews. This variation of data collection techniques helped in collecting more data about the same concept. For example, both the electronic questionnaire and semi-structured interviews collected data about digitization challenges. Both quantitative and qualitative data were collected and analyzed for this doctoral dissertation, which helped in providing more detailed results. For instance, quantitative and qualitative data about digitization challenges were analyzed to facilitate increased understanding about this concept.

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5.4. Limitations

This doctoral dissertation examined the adopted digitization guidelines for static and non-static (audiovisual) media, challenges encountered, and two types of solutions. Although considerable effort was expended in designing this study, several limitations were experienced beginning in the design phase. Understanding these limitations helps in understanding the scope and significance of this study more clearly and precisely.

The first set of limitations relates to the concept and sampling of this dissertation. This study only examines digitization guidelines adopted by academic libraries in the United States, whereas other type of libraries such as public or special libraries are not investigated. Sampling methodology is based on selecting only doctoral universities with highest and higher research activity based on the 2015 classification issued by The Carnegie Classification of Institutions of Higher Education. In the case of a single university with more than one library, only one of those libraries was selected. In other words, only one subject was selected from each university. This methodology led to a limited number of subjects that were included in this study.

The second set of limitations concerns aspects of the digitization process. Since digitization involves the coordination of many activities, it is inapplicable to discuss all these activities within this study. Instead, the five research questions in the first chapter of this doctoral dissertation (Section 1.3.) explain the scope of this study. Other digitization aspects do not fall within the defined scope, such as: digitization software, born digital materials, metadata, quality control, selection criteria, digital storage, copyright, and project planning.

The third set of limitations concerns the examined digitization guidelines for this doctoral dissertation. A limited number of national and regional digitization guidelines were analyzed, and only particular sections within these guidelines were included in the analysis process. These guidelines have a relatively limited time range based on their publication or revision dates (i.e., 2004-2017). The sampling methodology for selecting these guidelines focused on publicly available ones, which were accessible online. Selected sections from these guidelines were analyzed during the document analysis process. These analyzed sections related to file formats and technical specifications.

5.5. Chapter Summary

This doctoral dissertation examines digitization of static and non-static (audiovisual) media at academic libraries in the United States. It focuses on different themes concerning the digitization process. Exploring the digitization guidelines adopted by these academic libraries is one of the major themes of this dissertation. Further, compliance levels with these guidelines are investigated to attain a better understanding. Examining the digitization challenges facing these academic libraries represents another theme. Thus, this chapter provides a discussion addressing three implications: 1) theoretical, 2) practical, and 3) methodological.

The theoretical implications focus on two main aspects: *Digitization Guidelines and Compliance* and *Digitization Challenges*. The practical implications address the following two aspects: *Enhancing the Design of the Digitization Guidelines* and *Reducing Digitization Challenges*. The methodological implications discuss adoption of the explanatory design, purposive sampling, and triangulation of the three data collection techniques (i.e., document

analysis, electronic questionnaire, and semi-structured interviews). Finally, it reports on three

sets of limitations.

Chapter 6 Conclusion

This doctoral dissertation investigated digitization of static and non-static (audiovisual) media at academic libraries in the United States. Related aspects were investigated, such as adopted digitization guidelines, digitization technical specifications, compliance levels, availability levels, usefulness levels, digitization challenges, and applied and suggested solutions. A mixed methods research design (i.e., explanatory) was adopted to answer the five research questions. Document analysis, an electronic questionnaire, and semi-structured interviews were applied to collect data. Different data analysis techniques were adopted to analyze the collected quantitative and qualitative data. This doctoral dissertation (Chapter 4 Results) provided results of answers to the five research questions. The following sub-sections (Sections 6.1. and 6.2.) offer insights to and explanations for the *Contributions* of this doctoral dissertation (Section 6.1.) along with suggestions for *Future Research* (Section 6.2.).

6.1. Contributions

This doctoral dissertation examined several aspects regarding digitization of static and non-static (audiovisual) media at academic libraries in the United States. Five research questions were designed to collect the information needed about digitization of these two types of media at academic libraries. These questions discussed the main aspects of this doctoral dissertation, dealing with the following: 1) adopted digitization guidelines and technical specifications, 2) levels and reasons of compliance, availability, and usefulness, 3) differences in levels of compliance, availability, and usefulness between static and non-static (audiovisual) media, 4)

digitization challenges, 5) differences in challenges faced by academic libraries in digitizing static and non-static (audiovisual) media, 6) applied solutions, and 7) suggested solutions.

Results were reported using different data collection techniques: document analysis, electronic questionnaire, and semi-structured interviews. Results revealed that digitization guidelines differ in their designs and contents. This dissertation suggested some solutions to enhance the development and design of digitization guidelines, such as consistent terminology being used and suggesting that main sections be considered for inclusion when designing these guidelines.

Digitization challenges were examined by this doctoral dissertation. Different types of challenges faced in digitization of static and non-static (audiovisual) media at academic libraries were explored. It is assumed that advance awareness of these challenges may help in enhancing current or future digitization projects. Further, applied and suggested solutions were reported by the sample examined for this doctoral dissertation. These reported solutions may help in reducing, addressing or solving digitization challenges face academic libraries.

6.2. Future Research

One of the main scopes of this doctoral dissertation was to examine the digitization guidelines adopted by academic libraries in the United States. The selected sample was limited to only doctoral universities with highest and higher research activity based on the 2015 classification issued by The Carnegie Classification of Institutions of Higher Education. This means other universities not mentioned by this classification were not included in the selected

sample. However, future research may include a larger sample size by examining more universities and academic libraries. A larger number of subjects may help in collecting more data regarding digitization of static and non-static (audiovisual) media at academic libraries. Further, future research may examine digitization of static and non-static (audiovisual) media at smaller institutions that have limited resources to determine whether they face similar challenges.

Moreover, this dissertation found that the most adopted digitization guidelines are the university's own customized guidelines. Future research may examine the reason(s) that make academic libraries develop their own digitization guidelines instead of adopting national guidelines that are publicly available. This examination may include investigating whether the university digitization guidelines are developed based on existed guidelines (e.g., national or regional guidelines).

Document analysis for this doctoral dissertation examined only national and regional digitization guidelines. A limited number of guidelines were analyzed. Only five digitization guidelines (a total of nine documents) were selected for document analysis. This analysis did not include the entire document of the digitization guidelines, rather only specific sections of these guidelines were examined. Future research may include analyzing a larger number of digitization guidelines and the entirety of their contents. Analyzing a greater number of guidelines may help in providing more suggestions to enhance their designs. In addition, conducting a document analysis for local digitization plans at academic libraries might be considered as well for future research.

Different types of challenges faced in digitization of static and non-static (audiovisual) media were examined in this doctoral dissertation. Challenges faced in digitization at academic

libraries may differ in their types. Copyright, funding, guidelines, hardware, and metadata are examples. Tables 4.33 and 4.35 provided more types of digitization challenges explored in this dissertation. Future research may discuss digitization challenges for a specific type of media in order to reveal more detailed results. Also, future research may examine a single type of digitization challenge at academic libraries in more detail to gain a better understanding.

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APPENDICES

Appendix A: Technical Terms

Analog: "Analog data is encoded in signals that are continuous over a range or interval of values,

    for example, data transmitted over a telephone line that must be converted by a modem

    into the discrete values of digital code in order to be processed by a digital computer"

    (Reitz, 2004, p. 28).

Audiovisual: "A work in a medium that combines sound and visual images, for example, a

    motion picture or videorecording with a sound track, or a slide presentation synchronized

    with audiotape" (Reitz, 2004, p. 51).

Born digital: Besser (2003) explained born digital as "Creations originally generated in **digital**

    form rather than copies or surrogates of **analog** originals, and which exist entirely in a

    digital environment. Examples include software, **Web** pages, hypertext fiction, and

    digital art" (p. 68, emphasis original). Furthermore, Reitz (2004) defined born digital as

    "An informal term for a work created from scratch in electronic form, for example, a

    hypermedia thesis or dissertation, or an electronic journal that has no print counterpart"

    (p. 99).

Compliance: "when people obey an order, rule or request" (Walter, 2005, p. 251).

Digital: "The use of binary code to record information. "Information" can be text in a binary

    code like ASCII, or scanned images in a bit mapped form, or sound in a sampled digital

    form, or video. Recording information digitally has many advantages over its analog

counterpart, mainly ease in manipulation and accuracy in transmission" (Moore, 1991, p. 28).

Digital collection: "A collection of library or archival materials converted to machine-readable format for preservation or to provide electronic access" (Reitz, 2004, p. 216). It was also defined as "library materials produced in electronic formats, including e-zines, e-journals, e-books, reference works published online and on CD-ROM, bibliographic databases, and other Web-based resources" (Reitz, 2004, p. 216).

Digital object: "Data (the content or "essence" of a **digital** file) and the **metadata** describing it, regarded together as a single entity" (Besser, 2003, p. 72, emphasis original).

Digital surrogate: "Electronic or digitised copy of an original document, photograph, or other material. Digital surrogates are often used if the original item is fragile or inaccessible" (Archives Hub, n.d., para. 26).

OCR: "**O**ptical **C**haracter **R**ecognition or **R**eader. The ability of a scanner with the proper software to capture, recognize and translate printed alpha-numeric characters into machine readable text" (Moore, 1991, p. 59, emphasis original).

Usefulness: Rooney (2004) defined the term *useful* in *Bloomsbury English Dictionary* as "capable of being put to use or serving a purpose" (p. 2043). Also, the same previous dictionary defined *useful* as "having value or benefit, or bringing an advantage" (Rooney, 2004, p. 2043), besides the term *usefulness* was mentioned as a derivative word within the same headword.

Appendix B: Email Invitation of the Online Survey

Email Subject: An Online Survey

Hello!

I am conducting a research study to explore the digitization practices for digitizing static and non-static (audiovisual) media, as well as levels of compliance, availability, and usefulness of the adopted digitization guidelines by academic libraries in the United States, besides digitization challenges and solutions are also discussed. Approximately 224 subjects will participate in this research study. The online survey will take approximately 20-25 minutes to complete. This online survey collects the Internet Protocol (IP) address of this computer, demographic information about you (e.g., age, gender, years of experience on working on digitization, and current job title), and information regarding digitization at your university. Your participation in this online survey is voluntary, and it is greatly appreciated.

Your Subject Number is X. You will be asked to enter your subject number in the second question of the online survey. At the end of this email, there is a link to the online survey of this research study. Please, **Do Not** share your subject number or the link of the online survey with others.

You should meet the following requirements in order to enter the online survey:
1. The participant should be an adult (18 years old or more).
2. Working as a full-time job at the academic library, and working primarily on digitization.
3. Digitization of materials is conducted by the library staff at the academic library.
4. Your academic library had digitized a minimum of ten digital collections.
5. Born digital materials are not discussed in this online survey.

There is a drawing on ten Amazon.com gift cards upon participating in this online survey. Each Amazon.com gift card equals $50. Each participant in this online survey will have a chance to enter the drawing. Only ten winners will be selected by the drawing to win the Amazon.com gift cards. Each winner in the drawing will receive a $50 Amazon.com gift card. Each participant in this online survey will enter the drawing through entering his/her subject number in the online survey (a subject number is assigned to you in the email that you received to participate in this online survey). If you don't want to participate in this online survey but still want to enter the drawing, please send your name and email address to the researcher's email address

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(alghnimi@uwm.edu). The researcher will need to collect the participant's legal name and email address of each winner in the drawing in order to process the $50 Amazon.com gift card. The $50 Amazon.com gift card will be sent to each winner in the drawing after completing data collection for this study (approximately within 3-6 months).

If you have any questions or concerns regarding this research study, please contact Maali Alghnimi at email address alghnimi@uwm.edu

This is **the link to the online survey** of this research study: XXXXXXX

Thanks a lot in advance.

Maali Alghnimi
Dissertator at University of Wisconsin-Milwaukee

Appendix C: Electronic Questionnaire

University of Wisconsin – Milwaukee

Consent to Participate in Online Survey Research

Study Title: Digitization Guidelines for Static & Non-static (Audiovisual) Media: Compliance & Challenges in Academic Libraries.

Person Responsible for Research: Iris Xie (PI), and Maali Alghnimi (SPI)

Study Description: The purpose of this research study is to explore the digitization practices for digitizing static and non-static (audiovisual) media, as well as levels of compliance, availability, and usefulness of the adopted digitization guidelines by academic libraries in the United States, besides digitization challenges and solutions are also discussed. Approximately 224 subjects will participate in this study. If you agree to participate, you will be asked to complete an online survey that will take approximately 20-25 minutes to complete. The questions will ask about demographic information (e.g., age, gender, current job title, digitization expertise), and topics like digitization plan and practices at your university library for both static and non-static (audiovisual) media, digitization challenges, digitization solutions, digitization guidelines, besides levels of compliance, availability, and usefulness of the adopted digitization guidelines for digitizing static and non-static media.

Risks / Benefits: Risks to participants are considered minimal. This online survey collects demographic information about you (e.g., age, gender, years of experience on working on digitization, and current job title), and information regarding digitization at your university. Your participation in this online survey is voluntary. If you feel uncomfortable with the questions of this online survey, please stop answering this online survey immediately. Collection of data and survey responses using the internet involves the same risks that a person would encounter in everyday use of the internet, such as breach of confidentiality. While the researchers have taken every reasonable step to protect your confidentiality, there is always the possibility of interception or hacking of the data by third parties that is not under the control of the research team.

There will be no costs for participating. There are no benefits to you other than to further research. There is a drawing on ten Amazon.com gift cards upon participating in this online

survey. Each Amazon.com gift card equals $50. Each participant in this online survey will have a chance to enter the drawing. Only ten winners will be selected by the drawing to win the Amazon.com gift cards. Each winner in the drawing will receive a $50 Amazon.com gift card. Each participant in this online survey will enter the drawing through entering his/her subject number in the online survey (a subject number is assigned to you in the email that you received to participate in this online survey). If you don't want to participate in this online survey but still want to enter the drawing, please send your name and email address to the researcher's email address (alghnimi@uwm.edu). The researcher will need to collect the participant's legal name and email address of each winner in the drawing in order to process the $50 Amazon.com gift card. The $50 Amazon.com gift card will be sent to each winner in the drawing after completing data collection for this study (approximately within 3-6 months).

Limits to Confidentiality: Identifying information such as the Internet Protocol (IP) address of this computer, and demographic information (e.g., age, gender, state, current job title, and subject number) will be collected for research purposes like including the participants in this online survey in the drawing, and to select participants for the semi-structured interviews of this study. More information about the semi-structured interviews is available on the last section of this online survey. The subject number of each participant will be linked to the participant's name, email, and university. Data will be retained on the Qualtrics website server for until the end of the study and will be deleted after this time. However, data may exist on backups or server logs beyond the timeframe of this research project. Data transferred from the survey site will be saved in an encrypted format for until the end of the study. Only Iris Xie, Maali Alghnimi, and research team (e.g., intercoder and transcriptionist) will have access to the data collected by this study. However, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records. The research team will remove your identifying information after analyzing the data and all study results will be reported without identifying information so that no one viewing the results will ever be able to match you with your responses.

Voluntary Participation: Your participation in this study is voluntary. You may choose to not answer any of the questions or withdraw from this study at any time without penalty. Your decision will not change any present or future relationship with the University of Wisconsin Milwaukee.

Who do I contact for questions about the study: For more information about the study or study procedures, contact Iris Xie at (hiris@uwm.edu) or Maali Alghnimi at (alghnimi@uwm.edu).

Who do I contact for questions about my rights or complaints towards my treatment as a research subject? Contact the UWM IRB at 414-229-3173 or irbinfo@uwm.edu

Research Subject's Consent to Participate in Research:

By entering this survey, you are indicating that you have read the consent form, you are age 18 or older and that you voluntarily agree to participate in this research study.

Thank you!

- ○ Yes
- ○ No

Demographic & General Information

1. Please, enter the **Subject Number** given to you in the email, which you received to participate in this survey (<u>Subject Number</u> is **NOT** the <u>IRB#</u>):
   *(Please, enter **ONLY** the number)*

   [   ]

2. In which state is your academic university is located?

○ AK	○ HI	○ MI	○ NV	○ TX
○ AL	○ IA	○ MN	○ NY	○ UT
○ AR	○ ID	○ MO	○ OH	○ VA
○ AZ	○ IL	○ MS	○ OK	○ VT
○ CA	○ IN	○ MT	○ OR	○ WA
○ CO	○ KS	○ NC	○ PA	○ WI
○ CT	○ KY	○ ND	○ PR	○ WV
○ DC	○ LA	○ NE	○ RI	○ WY
○ DE	○ MA	○ NH	○ SC	
○ FL	○ MD	○ NJ	○ SD	
○ GA	○ ME	○ NM	○ TN	

3. What is your age?
   - ○ 18-29
   - ○ 30-39

○ 40-49
○ 50-59
○ 60-69
○ 70 or more

4. What is your gender?
   ○ Female
   ○ Male
   ○ Other

5. What is the most recent academic degree that you have earned?
   ○ High school
   ○ Bachelor
   ○ Master
   ○ Doctoral
   ○ Other

6. What is your current job title?

   ……………………………………………………………………………………………………..

7. How many years have you been working on **DIGITIZATION**?

   ………………………………………………………………………………………………...

8. How do you rate your expertise in **DIGITIZATION**?

   (1 indicates Not At All Expert, whereas 7 indicates Extremely Expert)

	Not At All Expert						Extremely Expert
	1	**2**	**3**	**4**	**5**	**6**	**7**
Digitization expertise	○	○	○	○	○	○	○

9. Have you ever taken any training program on **DIGITIZATION**?
- ○ Yes
- ○ No

Question # 10 will be displayed **ONLY** to participants who selected "Yes" in Question # 9

10. Please, select the nature of these training programs on **DIGITIZATION**:

(Please, select all that apply)
- ☐ Conferences
- ☐ Lectures
- ☐ Onsite courses
- ☐ Online learning
- ☐ Seminars
- ☐ Training sessions
- ☐ Workshops
- ☐ Other. Please, specify ……………………………..

11. Does your university have a **DIGITIZATION PLAN**?

(For this question, digitization plan refers to the documented rules, steps, procedures, and processes to guide the staff on performing digitization).

- ○ Yes
- ○ No
- ○ I do not know

12. Please, upload the **DIGITIZATION PLAN** that your university has. (Please, **Do Not** include the university name or any other information that may identify the university).

13. Please, select the **THREE HIGHEST PRIORITIZED** items that are chosen for digitization at your university:

(Please, give <u>number 1 for First Priority</u>, <u>number 2 for Second Priority</u>, and <u>number 3 for Third Priority</u>)

	Non-rare books
	Rare books
	Manuscripts
	Microform
	Maps
	Other oversized documents
	Posters
	Photographs
	Slides
	Three-dimensional objects
	Audio
	Film
	Video
	Other materials

14. Please, select the **THREE MOST DIFFICULT** items that are chosen for digitization at your university:

(Difficulty within this context refers to items that require more advanced digitization experience, besides they consume more time and effort during digitizing them)

(Please, give <u>number 1 for First in Difficulty</u>, <u>number 2 for Second in Difficulty</u>, and <u>number 3 for Third in Difficulty</u>)

	Non-rare books
	Rare books
	Manuscripts
	Microform
	Maps
	Other oversized documents
	Posters
	Photographs
	Slides
	Three-dimensional objects
	Audio
	Film
	Video
	Other materials

Digitization of Static Media

(Books, maps, photographs, posters, and manuscripts are examples of static media)

15. Does your university digitize **STATIC** media?

    (Examples of static media are: manuscripts, books, newspapers, maps, posters, and photographs)

    ○ Yes
    ○ No

16. Which one of the following sentences describes the digitization process of **STATIC** media at your university?

    ○ ONLY unique materials are selected for the digitization process
    ○ ALL the materials are subject to the digitization process

17. Which guideline(s) does your university use for digitizing **STATIC** media?

    (Please, select all that apply)

    ☐ ALCTS: *Association for Library Collections & Technical Services*

    ☐ BCR's CDP Digital Imaging Best Practices Working Group

    ☐ FADGI: *Federal Agencies Digital Guidelines Initiative*. Please, specify the level of imaging (1, 2, 3, or 4 star)…………………..

    ☐ IFLA: *International Federation of Library Associations and Institutions*

    ☐ NARA: *National Archives and Records Administration*

    ☐ Consortium/Consortia digitization guidelines

    ☐ University's own customized digitization guidelines

    ☐ Other digitization guidelines. Please, specify ……………………….............

18. What are the **TECHNICAL SPECIFICATIONS** that you follow their minimum requirements found in the digitization guideline(s) of **STATIC** media?

    (Please, select all that apply)

    ☐ Bit Depth
    ☐ Color Mode
    ☐ Color Space
    ☐ Compression
    ☐ Access File Format
    ☐ Master File Format
    ☐ Optical Character Recognition (OCR)
    ☐ Pixel Array
    ☐ Ratio
    ☐ Resolution
    ☐ Spatial Dimension
    ☐ Other. Please, specify ……………….

19. Based on the digitization guideline(s) that you have selected earlier for digitizing STATIC media, please indicate your **COMPLIANCE LEVEL** regarding the used digitization guidelines of **STATIC** media on a percentage scale from 0% to 100%.

    (0% indicates Not At All Complied, whereas 100% indicates Completely Complied).

	Not At All Complied					Completely Complied
	0%	20%	40%	60%	80%	100%
ALCTS: *Association for Library Collections & Technical Services*	○	○	○	○	○	○
BCR's CDP Digital Imaging Best Practices Working Group	○	○	○	○	○	○
FADGI: *Federal Agencies Digital Guidelines Initiative*	○	○	○	○	○	○
IFLA: *International Federation of Library Associations and Institutions*	○	○	○	○	○	○
NARA: *National Archives and Records Administration*	○	○	○	○	○	○

Consortium/Consortia digitization guidelines	○	○	○	○	○	○
University's own customized digitization guidelines	○	○	○	○	○	○
Other digitization guidelines. Please, specify …………………………....	○	○	○	○	○	○

20. Why are you **COMPLYING** with the selected digitization guideline(s) of **STATIC**

media? *Please, provide reason(s):*

(Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

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21. Why are you **NOT COMPLYING** with the selected digitization guideline(s) of

STATIC media? *Please, provide reason(s):*

(Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

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```

22. Based on the digitization guideline(s) that you have selected earlier for digitizing **STATIC** media, please indicate the **AVAILABILITY LEVEL** of the needed information from the digitization guidelines of **STATIC** media on a percentage scale from 0% to 100%.

(For this question, availability means that the needed digitization recommendation for digitizing static media is available in the used digitization guidelines)

(0% indicates Not At All Available, whereas 100% indicates Completely Available)

	Not At All Available					Completely Available
	0%	**20%**	**40%**	**60%**	**80%**	**100%**
ALCTS: *Association for Library Collections & Technical Services*	○	○	○	○	○	○
BCR's CDP Digital Imaging Best Practices Working Group	○	○	○	○	○	○
FADGI: *Federal Agencies Digital Guidelines Initiative*	○	○	○	○	○	○
IFLA: *International Federation of Library Associations and Institutions*	○	○	○	○	○	○
NARA: *National Archives and Records Administration*	○	○	○	○	○	○
Consortium/Consortia digitization guidelines	○	○	○	○	○	○
University's own customized digitization guidelines	○	○	○	○	○	○
Other digitization guidelines. Please, specify …………………………...	○	○	○	○	○	○

23. Based on your rating on the previous question, what are the reasons that made you select that percentage rating for the **AVAILABILITY** of digitization guidelines of **STATIC** media**?** *Please, provide reason(s):*

*(Giving your answer to this question will be greatly appreciated. Please, enter **N/A** if there is nothing to mention)*

24. Based on the digitization guideline(s) that you have selected earlier for digitizing **STATIC** media, please indicate the **USEFULNESS LEVEL** regarding the used digitization guidelines of **STATIC** media on a percentage scale from 0% to 100%.

(0% indicates Not At All Useful, whereas 100% indicates Completely Useful).

	Not At All Useful					Completely Useful
	0%	20%	40%	60%	80%	100%
ALCTS: *Association for Library Collections & Technical Services*	○	○	○	○	○	○
BCR's CDP Digital Imaging Best Practices Working Group	○	○	○	○	○	○
FADGI: *Federal Agencies Digital Guidelines Initiative*	○	○	○	○	○	○
IFLA: *International Federation of Library Associations and Institutions*	○	○	○	○	○	○
NARA: *National Archives and Records Administration*	○	○	○	○	○	○

Consortium/Consortia digitization guidelines	○	○	○	○	○	○
University's own customized digitization guidelines	○	○	○	○	○	○
Other digitization guidelines. Please, specify ………………………….....	○	○	○	○	○	○

25. Based on your rating on the previous question, what are the reasons that made you select

    that percentage rating for the **USEFULNESS** of digitization guidelines of **STATIC**

    media? *Please, provide reason(s):*

    (Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

26. Please, indicate your **AGREEMENT LEVEL** with the following statements regarding
    the challenges that encounter digitization at your university on a scale from 1 to 7.

    (1 indicates Not At All Agree, whereas 7 indicates Extremely Agree)

	Not At All Agree						Extremely Agree
	1	**2**	**3**	**4**	**5**	**6**	**7**
University has adequate long-term budget for digitization project(s) of static media	○	○	○	○	○	○	○

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University has adequate funding from external sources (*other than the university itself*) for digitization project(s) of static media	○	○	○	○	○	○	○
University has appropriate digitization equipment/hardware for digitizing static media	○	○	○	○	○	○	○
University has appropriate digitization software for digitizing static media	○	○	○	○	○	○	○
University staff have adequate digitization skills for digitizing static media	○	○	○	○	○	○	○
University staff need more professional training on digitization skills for static media	○	○	○	○	○	○	○

27. What are the **TOP FIVE CHALLENGES** that your university face during digitization of **STATIC** media?

(Giving your answer to this question will be greatly appreciated. Please, enter N/A into each field if there is nothing to mention)

Challenge # 1:	
Challenge # 2:	
Challenge # 3:	
Challenge # 4:	
Challenge # 5:	

28. Do you have any suggested **SOLUTIONS** to overcome these challenges facing digitization of **STATIC** media?

(Giving your answer to this question will be greatly appreciated. Please, enter N/A into each field if there is nothing to mention)

Solution # 1:	
Solution # 2:	
Solution # 3:	
Solution # 4:	
Solution # 5:	

Digitization of Non-static (Audiovisual) Media

(Voice recordings and analog videos are examples of non-static media)

29. Does your university digitize **NON-STATIC (AUDIOVISUAL)** media?

    (*Examples of non-static media are: voice recordings and analog videos*)

    ○ Yes
    ○ No

30. Which one of the following sentences describes the digitization of **NON-STATIC (AUDIOVISUAL)** media at your university?

    ○ ONLY unique materials are selected for the digitization process
    ○ ALL the materials are subject to the digitization process

31. Which guideline(s) does your university use for digitizing **NON-STATIC (AUDIOVISUAL)** media?

    (Please, select all that apply)

    ☐ ALCTS: *Association for Library Collections & Technical Services*

    ☐ IASA: *International Association of Sound and Audiovisual Archives*

    ☐ Consortium/Consortia digitization guidelines

    ☐ University's own customized digitization guidelines

    ☐ Other digitization guidelines. Please, specify …………………………............

32. What are the **TECHNICAL SPECIFICATIONS** that you follow their minimum requirements found in the digitization guidelines of **AUDIO** media?

(Please, select all that apply)

☐ Bit Depth
☐ Bit Rate
☐ Channel
☐ Compression
☐ Access File Format
☐ Master File Format
☐ Resolution
☐ Sample Rate
☐ Other. Please, specify ……………….

33. What are the **TECHNICAL SPECIFICATIONS** that you follow their minimum requirements found in the digitization guidelines of **VIDEO** media?

(Please, select all that apply)

☐ Aspect Ratio
☐ Compression
☐ Data Rate (Bit Rate)
☐ Field Rate
☐ Access File Format
☐ Master File Format
☐ Frame Rate
☐ Resolution
☐ Sample Size (Bit Depth)
☐ Sampling Scheme
☐ Scanning
☐ Video Standard
☐ Other. Please, specify ……………….

34. Based on the digitization guideline(s) that you have selected earlier for digitizing **NON-STATIC (AUDIOVISUAL)** media, please indicate your **COMPLIANCE LEVEL**

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regarding the used digitization guidelines of **NON-STATIC (AUDIOVISUAL)** media on a percentage scale from 0% to 100%.

(0% indicates Not At All Complied, whereas 100% indicates Completely Complied).

	Not At All Complied					Completely Complied
	0%	**20%**	**40%**	**60%**	**80%**	**100%**
ALCTS: *Association for Library Collections & Technical Services*	○	○	○	○	○	○
IASA: *International Association of Sound and Audiovisual Archives*	○	○	○	○	○	○
Consortium/Consortia digitization guidelines	○	○	○	○	○	○
University's own customized digitization guidelines	○	○	○	○	○	○
Other digitization guidelines. Please, specify …………………………...	○	○	○	○	○	○

35. Why are you **COMPLYING** with the selected digitization guideline(s) of **NON-STATIC (AUDIOVISUAL)** media? *Please, provide reason(s):*

(Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

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36. Why are you **NOT COMPLYING** with the selected digitization guideline(s) of **NON-STATIC (AUDIOVISUAL)** media? *Please, provide reason(s):*

(Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

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37. Based on the digitization guideline(s) that you have selected earlier for digitizing **NON-STATIC (AUDIOVISUAL)** media, please indicate the **AVAILABILITY LEVEL** of the needed information from the digitization guidelines of **NON-STATIC (AUDIOVISUAL)** media on a percentage scale from 0% to 100%.

(For this question, availability means that the needed digitization recommendation for digitizing non-static (audiovisual) media is available in the used digitization guidelines)

(0% indicates Not At All Available, whereas 100% indicates Completely Available)

	Not At All Available					Completely Available
	0%	**20%**	**40%**	**60%**	**80%**	**100%**
ALCTS: *Association for Library Collections & Technical Services*	○	○	○	○	○	○
IASA: *International Association of Sound and Audiovisual Archives*	○	○	○	○	○	○
Consortium/Consortia digitization guidelines	○	○	○	○	○	○
University's own customized digitization guidelines	○	○	○	○	○	○
Other digitization guidelines. Please, specify …………………………...	○	○	○	○	○	○

38. Based on your rating on the previous question, what are the reasons that made you select that percentage rating for the **AVAILABILITY** of digitization guideline(s) of **NON-STATIC (AUDIOVISUAL)** media**?** *Please, provide reason(s):*

(Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

39. Based on the digitization guideline(s) that you have selected earlier for digitizing **NON-STATIC (AUDIOVISUAL)** media, please indicate the **USEFULNESS LEVEL** regarding the used digitization guideline(s) of **NON-STATIC (AUDIOVISUAL)** media on a percentage scale from 0% to 100%.

(0% indicates Not At All Useful, whereas 100% indicates Completely Useful)

	Not At All Useful					Completely Useful
	0%	20%	40%	60%	80%	100%
ALCTS: *Association for Library Collections & Technical Services*	○	○	○	○	○	○
IASA: *International Association of Sound and Audiovisual Archives*	○	○	○	○	○	○
Consortium/Consortia digitization guidelines	○	○	○	○	○	○
University's own customized digitization guidelines	○	○	○	○	○	○
Other digitization guidelines. Please, specify ………………………….....	○	○	○	○	○	○

40. Based on your rating on the previous question, what are the reasons that made you select that percentage rating for the **USEFULNESS** of digitization guideline(s) of **NON-STATIC (AUDIOVISUAL)** media**?** *Please, provide reason(s):*

(Giving your answer to this question will be greatly appreciated. Please, enter N/A if there is nothing to mention)

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41. Please, indicate your **AGREEMENT LEVEL** with the following statements regarding the challenges that encounter digitization at your university on a scale from 1 to 7.

(1 indicates Not At All Agree, whereas 7 indicates Extremely Agree)

	Not At All Agree 1	2	3	4	5	6	Extremely Agree 7
University has adequate long-term budget for digitization project(s) of non-static (audiovisual) media	O	O	O	O	O	O	O
University has adequate funding from external sources (*other than the university itself*) for digitization project(s) of non-static (audiovisual) media	O	O	O	O	O	O	O
University has appropriate digitization equipment/hardware for digitizing non-static (audiovisual) media	O	O	O	O	O	O	O

University has appropriate digitization software for digitizing non-static (audiovisual) media   ○   ○   ○   ○   ○   ○   ○

University staff has adequate digitization skills for digitizing non-static (audiovisual) media   ○   ○   ○   ○   ○   ○   ○

University staff need more professional training on digitization skills for non-static (audiovisual) media   ○   ○   ○   ○   ○   ○   ○

42. What are the **TOP FIVE CHALLENGES** that your university face during digitization of **NON-STATIC (AUDIOVISUAL)** media?

*(Giving your answer to this question will be greatly appreciated. Please, enter **N/A** into each field if there is nothing to mention)*

Challenge # 1:	
Challenge # 2:	
Challenge # 3:	
Challenge # 4:	
Challenge # 5:	

43. Do you have any suggested **SOLUTIONS** to overcome these challenges facing digitization of **NON-STATIC (AUDIOVISUAL)** media?

(Giving your answer to this question will be greatly appreciated. Please, enter N/A into each field if there is nothing to mention)

Solution # 1:	
Solution # 2:	
Solution # 3:	
Solution # 4:	
Solution # 5:	

44. Do you have any further comments regarding the topics that were discussed in this electronic questionnaire? If **YES**, please type your comments in the following textbox.

This study will also conduct follow up semi-structured interviews to gain further insights into the purpose of the study. If you are interested in participating in an interview, please send your name, email address, and indicate your willingness to participate in an interview to the researcher's email (alghnimi@uwm.edu). Participation in the semi-structured interviews is entirely <u>optional</u>. The semi-structured interviews will be conducted online using Skype or through the telephone. You may send your name and email address to the researcher's email in order to be in the list of the <u>possible</u> participants in the semi-structured interviews. Not all individuals will be selected for the interviews, only <u>a particular number of participants</u> will be selected for the semi-structured interviews through a purposive sampling. In case if you were selected for the semi-structured interviews, each selected participant in the semi-structured interviews

will receive a $30 Amazon.com gift card after completing the interview. The $30 Amazon.com gift card will be sent to each participant in the semi-structured interviews after completing data collection for this study (approximately within 3-6 months).

Thank You for Your Participation

Appendix D: Interview Invitation Email

Email Subject: Interview Invitation (Please, Reply within 3 Days)

Hello!

This is an invitation to participate in the semi-structured interviews of a research study to explore the digitization practices for digitizing static and non-static (audiovisual) media, as well as levels of compliance, availability, and usefulness of the adopted digitization guidelines by academic libraries in the United States, besides digitization challenges and solutions are also discussed. Your participation in the semi-structured interview is voluntary, and it is greatly appreciated. **The semi-structured interviews will be conducted online using Skype or through the telephone.** The interview will take **approximately 30 minutes** of your time. **The researcher will assign a subject number to you, which will be used during the interview.**

If you are interested in participating in an interview, please send your name, email address, and indicate your willingness to participate in an interview to the researcher's email (alghnimi@uwm.edu) in order to be in the list of the possible participants in the semi-structured interviews. Only a particular number of participants will be selected for the semi-structured interviews through a purposive sampling. **In case if you were selected for the semi-structured interviews, each selected participant in the semi-structured interviews will receive a $30 Amazon.com gift card after completing the interview**. The $30 Amazon.com gift card will be sent to each participant in the semi-structured interviews after completing data collection for this study (approximately within 3-6 months).

If you are interested in participating in an interview, please reply to this email within three days.

Thanks a lot in advance.

Maali Alghnimi
Dissertator at University of Wisconsin-Milwaukee

Informed Consent

UW - Milwaukee

University of Wisconsin – Milwaukee
Consent to Participate in Interview Research

Study Title: Digitization Guidelines for Static & Non-static (Audiovisual) Media: Compliance & Challenges in Academic Libraries

Person Responsible for Research: Iris Xie (PI), and Maali Alghnimi (SPI)

Study Description: The purpose of this research study is to explore the digitization practices for digitizing static and non-static (audiovisual) media, as well as levels of compliance, availability, and usefulness of the adopted digitization guidelines by academic libraries in the United States, besides digitization challenges and solutions are also discussed. Approximately 15 subjects will participate in this study. If you agree to participate, you will be asked to participate in an interview. During this interview you will be asked questions about topics like digitization practices at your university library for both static and non-static (audiovisual) media, digitization challenges, digitization solutions, digitization guidelines, besides levels of compliance, availability, and usefulness of the adopted digitization guidelines for digitizing static and non-static media. This will take approximately 30 minutes of your time. The interview will take place over the phone or online/through Skype and it will be audio recorded.

Risks / Benefits: Risks that you may experience from participating are considered minimal. There are no costs for participating. There are no benefits to you other than to further research.

Each participant in the semi-structured interview will receive a $30 Amazon.com gift card after completing the interview. The researcher will need to collect the participant's legal name and email address of each participant in the semi-structured interviews in order to process the $30 Amazon.com gift card. The $30 Amazon.com gift card will be sent to each participant in the semi-structured interviews after completing data collection for this study (approximately within 3-6 months).

Confidentiality: During the interview your name will not be used. The researcher will assign a subject number to you, this subject number will be used during the interview. The subject number of each participant will be linked to the participant's name, email, and university. Your responses will be treated as confidential and any use of your name and or identifying information about anyone else will be removed during the transcription process so that the transcript of our conversation is deidentified. All study results will be reported without identifying information so that no one viewing the results will ever be able to match you with your responses. Direct quotes

may be used in publications or presentations. Data from this study will be saved on networked and password-protected computer in a locked room at NWQB 6479 on UWM campus for until completing the study. Only Iris Xie, Maali Alghnimi, and research team (e.g., transcriptionist and intercoder) will have access to your information. However, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records. Audio recordings will be destroyed after completing this study.

Voluntary Participation: Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with the University of Wisconsin Milwaukee. There are no known alternatives available to participating in this research study other than not taking part.

Who do I contact for questions about the study: For more information about the study or study procedures, contact Maali Alghnimi at (alghnimi@uwm.edu).

Who do I contact for questions about my rights or complaints towards my treatment as a research subject? Contact the UWM IRB at 414-229-3173 or irbinfo@uwm.edu.

Research Subject's Consent to Participate in Research:
To voluntarily agree to take part in this study, you must be 18 years of age or older. By signing the consent form, you are giving your consent to voluntarily participate in this research project.

_____
Printed Name of Subject/Legally Authorized Representative

_____   _____
Signature of Subject/Legally Authorized Representative   Date

Appendix F: Interview Questions

1. What types of materials do you digitize at your academic library? Is the digitization process conducted by the library staff?

2. What are the digitization guidelines adopted by your academic library for digitizing static and/or non-static (audiovisual) media?

3. What elements or sections of these digitization guidelines are you adopting/following to digitize static and/or non-static (audiovisual) media?

4. Are the needed information available and useful in these digitization guidelines to digitize static and/or non-static (audiovisual) media? Please, explain.

5. On a percentage scale from 0% to 100% (*0% is not at all complied, and 100% is completely complied*), to what extent do you comply with the adopted digitization guidelines for digitizing static and/or non-static (audiovisual) media? What are the reasons that make you comply with the adopted digitization guidelines? What are the reasons that make you not comply with the adopted digitization guidelines?

6. Do you have any suggestions to enhance these digitization guidelines for digitizing static and/or non-static (audiovisual) media? What would you like to add to these digitization guidelines?

7. What are the challenges that you face in digitizing static and/or non-static (audiovisual) media at your academic library?

8. What are the solutions that you apply to overcome these challenges facing digitization of static and/or non-static (audiovisual) media? Please, give examples of the applied solutions.

9. What are the desired solutions (not yet applied) that you think they might be helpful to overcome these challenges facing digitization of static and/or non-static (audiovisual) media? Please, give examples of the desired solutions.

10. Do you have any comments regarding enhancing digitization of static and/or non-static (audiovisual) media?

More explanation(s) might be requested from the human subjects during discussing each question.

Appendix G: Tests of Normality

These tables are based on the tests of normality by IBM SPSS Statistics 25 for the levels of compliance collected by questions 19 and 34 in the electronic questionnaire:

Table G. 1
Tests of Normality for Compliance Level with ALCTS Digitization Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Compliance Level with ALCTS for Static Media	.252	8	.144	.802	8	.030
Compliance Level with ALCTS for Non-static (Audiovisual) Media	.246	8	.169	.891	8	.239

a. Lilliefors Significance Correction

Table G. 2
Tests of Normality for Compliance Level with Consortium/Consortia Digitization Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Compliance Level with Consortium Guidelines for Static Media	.189	7	.200[*]	.860	7	.150
Compliance Level with Consortium Guidelines for Non-static (Audiovisual) Media	.184	7	.200[*]	.880	7	.226

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table G. 3
Tests of Normality for Compliance Level with the University's Own Customized
Digitization Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Compliance Level with University Guidelines for Static Media	.316	22	.000	.621	22	.000
Compliance Level with University Guidelines for Non-static (Audiovisual) Media	.242	22	.002	.776	22	.000

a. Lilliefors Significance Correction

These tables are based on the tests of normality by IBM SPSS Statistics 25 for the

availability levels collected by questions 22 and 37 in the electronic questionnaire:

Table G. 4
Tests of Normality for the Availability Level of the Needed Digitization
Recommendation in ALCTS Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Availability Level of the Needed Information in ALCTS for Static Media	.316	8	.018	.772	8	.014
Availability Level of the Needed Information in ALCTS for Non-static (Audiovisual) Media	.216	8	.200[*]	.828	8	.056

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table G. 5

Tests of Normality for the Availability Level of the Needed Digitization Recommendation in the Consortium/Consortia Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Availability Level of the Needed Information in Consortium Guidelines for Static Media	.313	9	.011	.711	9	.002
Availability Level of the Needed Information in Consortium Guidelines for Non-static (Audiovisual) Media	.295	9	.023	.731	9	.003

a. Lilliefors Significance Correction

Table G. 6

Tests of Normality for the Availability Level of the Needed Digitization Recommendation in the University's Own Customized Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Availability Level of the Needed Information in University Guidelines for Static Media	.454	21	.000	.558	21	.000

300

	Statistic	df	Sig.	Statistic	df	Sig.
Availability Level of the Needed Information in University Guidelines for Non-static (Audiovisual) Media	.276	21	.000	.710	21	.000

a. Lilliefors Significance Correction

The following tables are based on the tests of normality by IBM SPSS Statistics 25 for the usefulness levels collected by questions 24 and 39 in the electronic questionnaire:

Table G. 7
Tests of Normality for the Usefulness Level of ALCTS Digitization Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Usefulness Level of ALCTS for Static Media	.286	6	.136	.863	6	.201
Usefulness Level of ALCTS for Non-static (Audiovisual) Media	.265	6	.200[*]	.869	6	.221

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table G. 8
Tests of Normality for the Usefulness Level of the Consortium/Consortia Digitization Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Usefulness Level for Consortium Guidelines for Static Media	.376	6	.008	.666	6	.003
Usefulness Level for Consortium Guidelines for Non-static (Audiovisual) Media	.368	6	.011	.682	6	.004

a. Lilliefors Significance Correction

Table G. 9
Tests of Normality for the Usefulness Level of the University's Own Customized Digitization Guidelines

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Usefulness Level of University Guidelines for Static Media	.394	18	.000	.521	18	.000
Usefulness Level of University Guidelines for Non-static (Audiovisual) Media	.358	18	.000	.659	18	.000

a. Lilliefors Significance Correction

The following tables are based on tests of normality by IBM SPSS Statistics 25 for the agreement levels collected by questions 26 and 41 in the electronic questionnaire for the statements concerning: 1) budget, 2) external funding, 3) digitization equipment/hardware, 4)

digitization software, 5) staff digitization skills, and 6) the need for more professional training on

digitization:

Table G. 10
Tests of Normality for the Statements Regarding Budget

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Agreement Level for Budget of Static Media	.178	35	.006	.910	35	.008
Agreement Level for Budget of Non-static (Audiovisual) Media	.238	35	.000	.816	35	.000

a. Lilliefors Significance Correction

Table G. 11
Tests of Normality for the Statements Regarding External Funding

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Agreement Level for Funding from External Sources for Static Media	.232	35	.000	.835	35	.000
Agreement Level for Funding from External Sources for Non-static (Audiovisual) Media	.261	35	.000	.796	35	.000

a. Lilliefors Significance Correction

Table G. 12

Tests of Normality for the Statements Regarding Digitization Equipment/Hardware

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Agreement Level for the Digitization Equipment/Hardware for Static Media	.220	35	.000	.894	35	.003
Agreement Level for the Digitization Equipment/Hardware for Non-static (Audiovisual) Media	.223	35	.000	.862	35	.000

a. Lilliefors Significance Correction

Table G. 13

Tests of Normality for the Statements Regarding Digitization Software

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Agreement Level for the Digitization Software of Static Media	.238	34	.000	.894	34	.003
Agreement Level for the Digitization Software of Non-static (Audiovisual) Media	.182	34	.006	.899	34	.004

a. Lilliefors Significance Correction

Table G. 14
Tests of Normality for Statements Regarding Staff Digitization Skills

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Agreement Level for the Digitization Skills for Static Media	.264	35	.000	.864	35	.001
Agreement Level for the Digitization Skills for Non-static (Audiovisual) Media	.165	35	.017	.927	35	.023

a. Lilliefors Significance Correction

Table G. 15
Tests of Normality for Statements Regarding the Need for more Professional Training on Digitization

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Agreement Level for the Need of More Professional Training on Digitization for Digitizing Static Media	.146	35	.057	.942	35	.066
Agreement Level for the Need of More Professional Training on Digitization for Digitizing Non-static (Audiovisual) Media	.196	35	.002	.829	35	.000

a. Lilliefors Significance Correction

CURRICULUM VITAE

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Education

PhD, School of Information Studies, University of Wisconsin-Milwaukee, December 2018
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Master Degree, Kuwait University, July 2012
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Translator, College of Science Library, Kuwait University, 2007-2014

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