Difficulties in Launching Digitization at Museums: The Case of Lithuanian Municipal Museums

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Abstract

Digital technologies are inseparable from museum practices but working on them from scratch has not been well studied. This study explores the difficulties of digitization in 54 Lithuanian municipal museums. The complete questionnaire (N=50) on the targeted museums was conducted in 2017, which aimed to gain empirical data on digitization. Responses to free-text questions in the questionnaire revealed the difficulties of digitization. Faulty equipment, lack of competency, and increased workload were difficulties for personnel; a lack of equipment, personnel, and structural reform due to inadequate funds were institutional challenges. The analysis indicates the first three phases of digitization obstacles in museums: the accomplishment of the minimum requirements, pursuit of quantity, and attempts at better quality.

Key words: Digitization, Museum Professionals, Questionnaire, Lithuania

Introduction

Today, digital technologies are inseparable from museum practices. Notably, digitization, in other words, the preparation of an object's digital images and metadata, widens museums' digital presence and activities. For instance, the digital database of museum collections enriches the accessibility of museums.[1] Still, a concrete method of measuring its impact has not been established,[2] even though various users appreciate digital content provided by museums.[3] Recently, museums' digital presence was valued during an extended closure of museums because of the COVID-19 pandemic (UNESCO 2020). In previous studies of digitization in museums, attempts to make technological advances and recording best practices were dominant subjects.[4] However, many museums have not yet started to digitize;[5] and not every museum can afford up-to-date technologies simultaneously.

So, what would happen when a museum attempts to start digitizing from scratch? They are likely to be confronted with some challenges or difficulties before they catch up with up-to-date best practices. However, those challenges were not the primary focus in the previous studies. Thus, this article will explore the difficulties of digitization in museums at the beginning of the process. The subject of the survey is a group of museums that have just started to digitize: municipality museums in the Republic of Lithuania.

Most municipality museums in Lithuania started digitizing in the last decade. One of the triggers was the launch of LIMIS (Lietuvos integrali muziejų informacinė sistema, which means, 'Lithuanian integral museum information system' in Lithuanian) in 2012 (Fig. 1).[6] The LIMIS aggregates digitized information for Lithuanian museums: museum workers register digitized museum objects, its manager in the National Lithuanian Art Museum (Lietuvos nacionalinis dailės muziejus) manages data, and public users search and access them. Almost every public museum in Lithuania started digitizing after the LIMIS launch (Kimura 2018). Thus, municipality museums in Lithuania have just started to digitize, and are therefore suitable for the survey in this study.
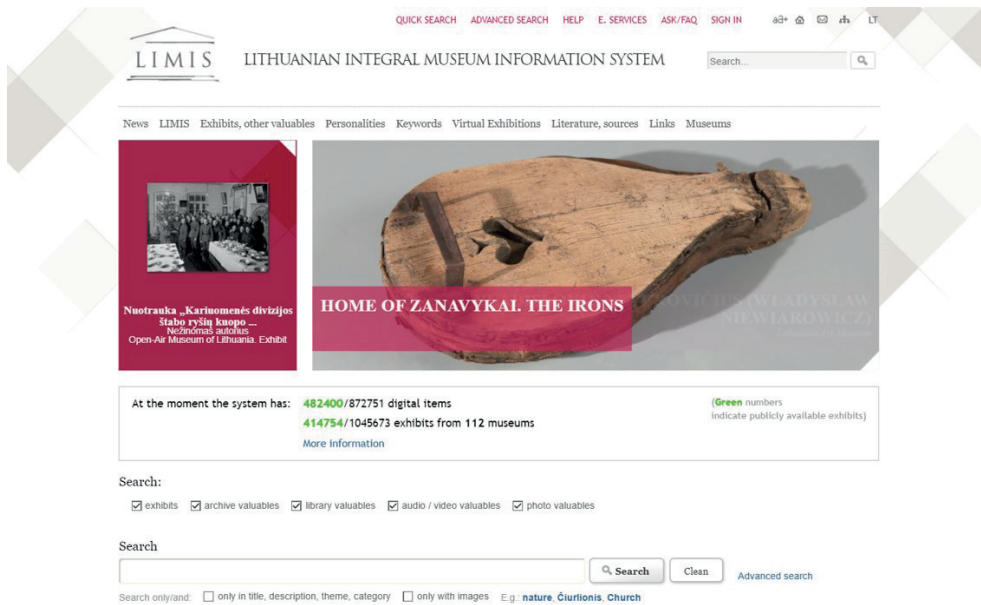
Fig. 1 Screenshot of LIMIS Portal

The method of the survey was a questionnaire on 54 Lithuanian municipality museums (N=50). The survey was conducted in 2017. Both quantitative and qualitative data were gained from the study. Additionally, official statistics by the Ministry of Culture of the Republic of Lithuania[7] were referenced. Descriptive statistics were applied for the quantitative data, and analysis based on categorization was applied to the qualitative data.

In the following sections, previous studies on the challenges of technology usage in museums will be reviewed. The research setting of the survey (a background of Lithuanian municipality museums) will follow. Then, the methods and the results will be explained – consequently, the discussion section will consider three phases of digitization difficulties.

Background: Challenges of Technology Uses in Museums

Digitization is not the first digital innovation to be implemented in museums. The challenges of technology usage in museums have already been studied from several perspectives. This section will review them for a better understanding of the design of the questionnaire survey.

Computers were the first digital technology used in museums. Parry discussed some of the obstacles that museums faced in the second half of the twentieth century, when they tried to introduce computers: risk, time, cost and sustainability, skills and training, language and jargon, factory culture, resisting technology-led innovation, and non-adaptive institutional structures (Parry 2007: 117-31). These obstacles show that new technology requires an institution to adopt new practices. Such matters go beyond simple computer usage; information management comprises 'social practices as much as technical ones' that 'occur in an organizational context of people, relationships and ideas' (Peacock 2008: 60). These studies infer that acceptance by both people and organizations are essential to implementing new technology in museums.

Some literature focused more intensely on people and digital activities in museums. They mainly discuss the need for additional human resources with digital-related competence. For instance, significant museums hired professionals with digital expertise (Leshchenko 2015: 237-8). Recently, the Portuguese project Mu.SA has been led by staff with four emerging job profiles in museums of the digital age (digital strategy manager, digital collection curator,

digital interactive experience developer, and online community manager) to design training programs for professionals (Carvalho and Matos 2018: 43-4). From another perspective, a survey in the Western Cape in South Africa points out a 'lack of knowledge of digitization initiatives in smaller museums' (de la Porte and Higgs 2019). Hence, digital technology in museums demands additional skills and competence of workers.

In previous studies, institutional structures and human resources were crucial for understanding technology adaptation in museums. As the launch of digitization in museums is one form of technology adaptation, these two aspects would be significant. The survey will explore the difficulties of digitization from both the perspectives of people and organizations. Research Settings: Lithuanian Museums and Technology

The primary survey for this research focuses on a specific case – Lithuanian municipality museums. Although many museums are working on digital activities, regardless of their location, it is essential to consider the Lithuanian case. Thus, this section reviews the historical background of Lithuanian museums' technology usage, the central system of museum digitization in Lithuania, and the characteristics of Lithuanian municipality museums.

First of all, Lithuanian museums have a relatively short history of computer technology use. Digitization in Lithuanian museums began in 1989 (Kapleris 2013). Although the first Lithuanian computers emerged in the 1960s, their usage in the humanities field only began after Lithuania achieved independence from the USSR in 1990 (Kapleris 2013), and museum websites appeared around 1995 and 1997 (Mukienė 2011). The first Lithuanian virtual exhibition, which 'consisted of blocks of images that were selected and linked together according to a specific topic,' was available online around 2000 (Mukienė 2015). From 2003 to 2004, the first digitization system, RIS (Rinkinių informacinė sistema, which means 'Collections' Information System'), was developed in the Lithuanian Art Museum.[8] The first inter-museum system, LIMIS, was launched in 2009.

LIMIS acts as an aggregator of digitized objects, a network of museums in Lithuania, and a web portal for visitors to search and view data. The Lithuanian Art Museum (Lietuvos dalės muziejus) initiated its development, as regulated in a national strategy for digital cultural heritage.[9] The Ministry of Culture of the Republic of Lithuania (henceforth, the Ministry of Culture) enacted the strategy in reference to the European context of digital heritage in memory institutions (libraries, archives, and museums).[10] The system was expanded to other museums after LIMIS finished its development phase in 2012. As of 2020, 110 institutions are already registered to LIMIS. Approximately 408,676 items in museum collections are accessible on the portal site of LIMIS: almost all Lithuanian museums have already registered on LIMIS.[11]

Lithuanian municipal museums (savivaldybės muziejus) are the subject of this study.

*Fig. 2 Statistical data of Lithuanian museums according to category (2017) ***

	No.	Total number of objects stored in each museum		Total number of workers in each museum		The total amount of budget (Eur)	
		Average	Total	Average	Total	Average	Total
National museums	4	533,664	2,134,657	268	1,071	7,403,648	29,614,590.88
State museums	15	330,988	2,647,906	130	1,041	2,209,922	17,679,373.77
Municipal museums	54	39,214	2,117,542	17	939	250,083	13,504,500.07
Affiliated museums	22	21,432	471,501	8	166	70,157	1,543,445.51
Others	9	5,919	53,268	12	104	94,140	847,263.28

*Lietuvos Respublikos Vyriausybė, 'Muziejai ir galerijos', Lietuvos Respublikos kultūros ministerija. http://lrkm.lrv.lt/lt/veiklos-sritys/muziejai-ir-galerijos, accessed 6 September 2020.

Fig. 2 Statistical data of Lithuanian museums according to category (2017)

The municipal museum is one of five categories of museums defined by the Museum Law.[12] Lithuanian museum statistics reveal the total and average scale of each category's collections, budgets, and human resources (Fig. 2). At a micro level, the scale of each municipal museum is smaller than national and state museums for all three categories defined by the Museum Law. However, the scale of the collections, budgets, and human resources of all municipal museums are almost equivalent to those at the national and state levels. In other words, Lithuanian municipal museums are relatively small scale, but they accommodate an appropriate amount of collections and human resources.

The subjects of this study are not unusual or atypical museums. Lithuanian museums started to adopt computer technologies after the 1990s for historical reasons. Moreover, the LIMIS system is already at the center of Lithuanian museums' digitization activities. In other words, Lithuanian museums need no preliminary preparation for the system to manage digitized information. On the other hand, the scale of the municipal museums is relatively small in Lithuania. These aspects will be considered in the discussion section.

The Aim, Subject, and Method of the Study

The main goal of this study is to grasp the difficulties of digitization in each museum, which reflect the obstacles for museums once they have started the process. Moreover, this paper intends to understand the current situation but not to create guidelines. To pursue this aim, the research subjects are museums that have just started to digitize. Therefore, 54 Lithuanian municipal museums were the subject of the questionnaire.

The author distributed the questionnaire in November 2017 via email. The questionnaires were sent to personnel responsible for digitization in each targeted museum. Both the language of the questionnaire and the responses were in Lithuanian and subsequently translated into English by the author. The responses were collected via email and postal mail. The responses to the questionnaire were collected from 50 respondents out of 54 targets (N=50); approximately 93 per cent of Lithuanian municipal museums answered the questionnaire. This questionnaire survey was conducted simultaneously with another survey carried out by Kimura (2018).[13]

The questionnaire consisted of multiple-choice questions, short-answer questions, and free-description questions. The first half of the questionnaire included several multiple-choice style questions in order to grasp the background of the targeted museums. The questions aimed to gain the necessary information regarding how each museum worked on digitization. This includes managing museum collections (objects) and digital data, using LIMIS and its aims, and the institutional structure for digitization. The latter half had free-description questions focusing on personnel and organizational challenges. The questions were:

[Multiple-choice and short-answer questions]

Q1-1 How does your museum manage digitized data?

    a) By LIMIS

    b) By another electronic system

    c) Without an electronic system

Q1-2 How does your museum manage its collection?

    a) By paper book

    b) By electronic system (including LIMIS)

    c) By both paper book and electronic system

Q1-3 Which department is responsible for digitization? [short answer]

Q1-4 What is the purpose of using LIMIS?

    a) Only for management

    b) Both for management and publication, but management is more important

    c) Both for management and publication

    d) Both for management and publication, but publication is more important

    e) Only for publication

[Free-text questions]

Q2-1 Have there been any objections or complaints from workers about digitization? If so, how did you solve them?

Q2-2 What are the current challenges of digitization in your museum?

Also, the official Lithuanian museum statistics related to digitization were analyzed.[14] The subject of this study is the total number of digitized objects and the number of digitized objects in the reported year. Because the annual report format changed, data for these two items were reported only from 2010 to 2019. Thus, this study will only refer to the data during this period.

The responses to the multiple-choice questions and the short-answer questions were aggregated and analyzed as quantitative data. Descriptive statistics were adopted for quantitative data both from the questionnaire survey and the official statistical data. On the other hand, responses to the free-text questions were analyzed as qualitative data. Firstly, texts written in Lithuanian from each question were translated into English and categorized into independent groups. The discussion will be based on the result of analyses of both quantitative data and qualitative data.

The Situation of Digitization in Lithuanian Municipal Museums: Descriptive Statistics

This section will analyze the result of the first half of the questionnaire – the multiple-choice questions and the short-answer question. Related official statistics will also be analyzed. It is essential to understand at first how each Lithuanian municipal museum works on digitization. The questions concerned with practices of digitization and descriptive statistics were applied for each data set. The answers to four questions are represented in graph form (Fig. 3 to Fig. 6). Furthermore, statistical data analysis relating to museum digitization was conducted and described in graph form (Fig. 7 and Fig. 8).

The digitization of collections requires their management. Fig. 3 shows the answers to the question Q1-1. Currently, most of the respondents use LIMIS as a system to organize digital data. On the other hand, the museum collections of physical objects also require management, which is the traditional work of museums. The responses to questions Q1-2 are shown in Fig. 4, which indicates that most museums use paper books.

Nonetheless, almost half of the respondents answered that they use an electronic system. These responses indicate that already most of the museums manage digitized data using LIMIS. However, the management of digitized objects is not necessarily linked to the digital management of physical objects.

One of the fundamental interests of the questionnaire concerned how digitization work is shared in each museum. Question Q1-3, 'Which department is responsible for digitization?' aimed to ask about this matter (Fig. 5). Most of the museums did not have such a department.
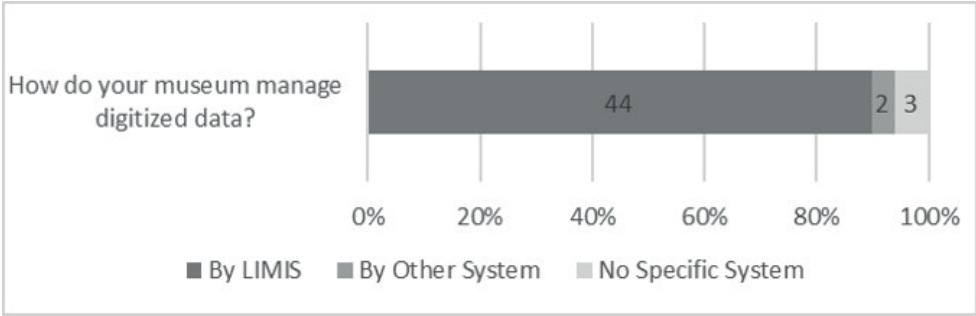
Fig. 3 Responses to Q1-1 How does your museum manage digitized data?
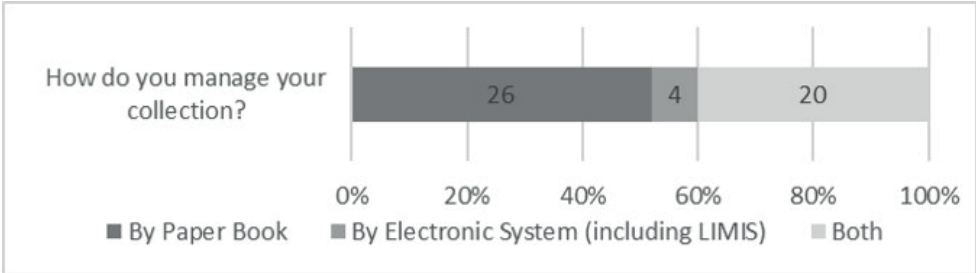

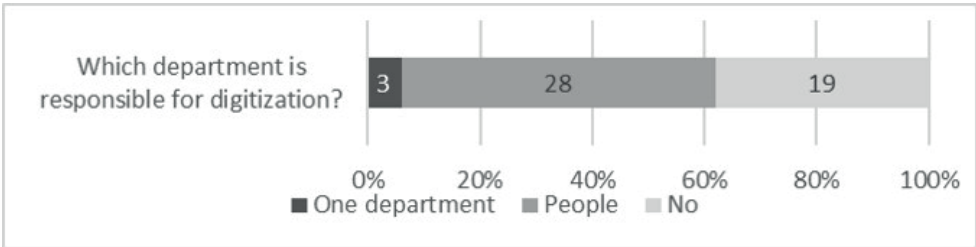Fig. 4 Responses to Q1-2 How does your museum manage its collection?

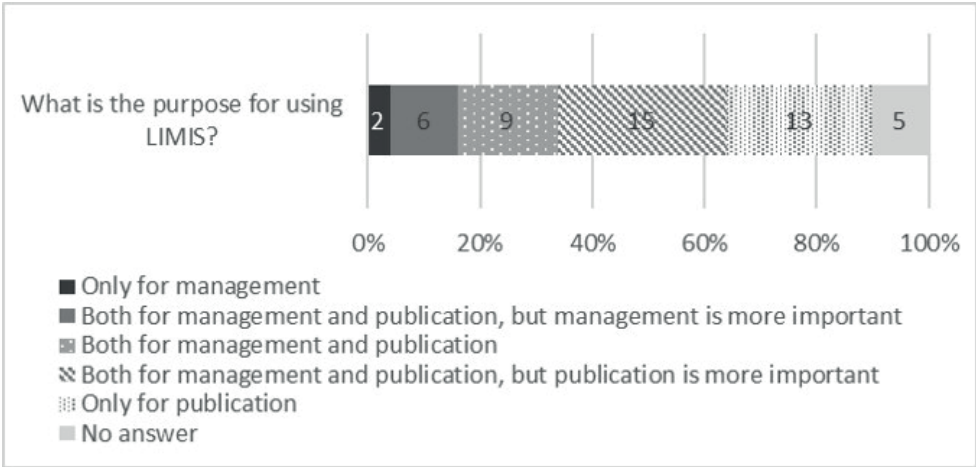Fig. 5 Responses to Q1-3 Which department is responsible for digitization?

Fig. 6 Responses to Q1-4 What is the purpose of using LIMIS?

Instead, the majority of respondents answered that some personnel are responsible for this activity. Only three respondents said that they have a section responsible for this, though none was specialized in digitization. Structural change to accommodate digitization in each institution has not yet occurred.
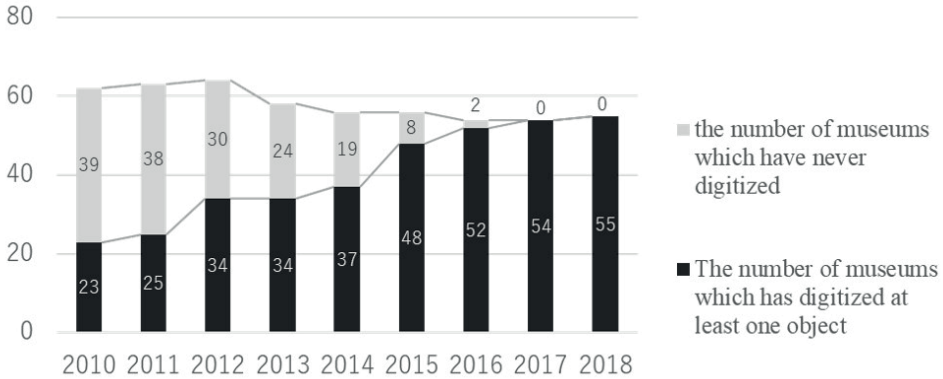

Fig. 7 The number of museums which has digitized at least one object, and the number of museums which have never digitized (2010-2018)
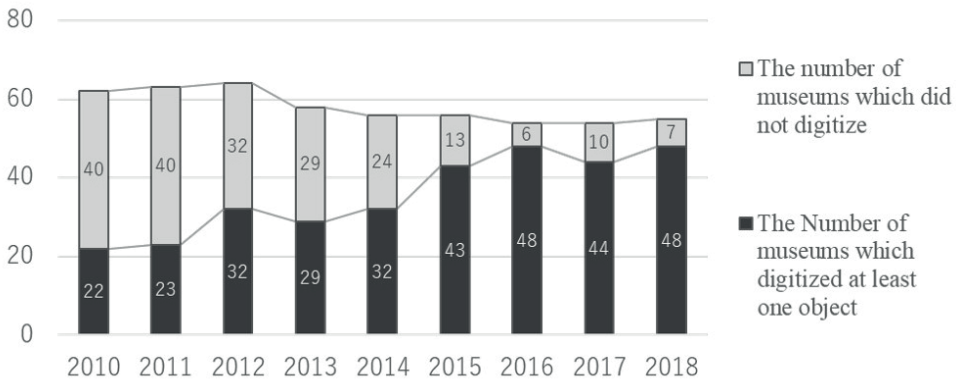

Fig 8 The Number of museums which digitized at least one object, and the number of museums which did not digitize

The motivation for applying a digital management system to physical objects seems to be related to the purpose of digitization for each respondent. Since 'digitization' ('skaitmeninimas' in Lithuanian) itself might be unfamiliar to some respondents, the question was, Q1-4, 'What is the purpose of using LIMIS?' (Fig. 6). According to the function of LIMIS, this question assumed that the purposes of LIMIS usage include the management or publication of collections in each institution. Although importance differs, many museums regarded LIMIS as vital for both management and publication. However, many museums focus more on publication rather than management. Publication in this context means to show digitized collections online via LIMIS. This result supports the outcome of another question, which indicated that about half of municipal museums do not yet utilize a digitization system for collection management.

Official statistics of Lithuanian municipal museums reveal another aspect of their digitization. Since municipal museums are obliged to submit an annual report to the Ministry

of Culture, the result shows that data from Lithuanian municipal museums exist for each year. Firstly, the number of museums that have already started digitization decreases every year (Fig. 6). However, not every museum digitizes each year. Although the ratio of museums that digitized at least one object increased over a decade, some museums did not digitize at all (Fig. 7). This result implies the difficulties related to continuous digitization.

Lithuanian municipal museums seem to be working well on digitization, but the analyses of the questionnaire's responses and the official statistical data indicate various scenarios. The policy of computer usage, personnel responsible, and even the objectives of digitization are not all the same. The statistics show that not all museums, once digitizing, would digitize continuously. Thus, it is possible to assume that many of the respondents were not fortunate enough to have a digitization environment or internal policy for it. In the following analyses, difficulties faced by museums will be revealed from the free-description answers to the questionnaire.

Result and Analysis of Qualitative Data

Challenges for Personnel

Digitization mainly consists of manual work. People rather than robots take photos or scan and input metadata to construct a database. Thus, the first part of the free-description question was intended to explore difficulties for specialized workers in museums. The question was Q2-1 'Have there been any objections or complaints from workers about digitization? If so, how did you solve them?' Out of 50 respondents, 13 answered that they have faced challenges (but only three answered how they overcame them), 28 answered they did not, and nine did not answer the question.

This section will analyze the text by the 13 respondents. Each response was classified into several relevant categories. Some respondents gave solutions to these difficulties; they were also analyzed accordingly. The responses led to three categories being identified: equipment, competencies, and imbalance of workload and human resources.

Equipment typically required for digitization includes a digital camera, a scanner, and a computer. One respondent wrote that there was a 'lack of equipment necessary for the digitization process.' Another wrote that '[the number of people] who are willing to work with computers was more than [the number of computers].' These complaints describe the fact that specialists in museums could not undertake digitization because they do not have the means. However, these seemed to be solved as respondents consequently wrote that they had 'purchased' the required equipment. Even after the purchase of specific equipment, another issue emerges in that they are seeking 'adequate equipment' or a '[better] quality of scanner.' Since digital technology projects always require improved equipment for better performance, purchasing equipment in addition to updating and upgrading it appear to be obstacles to digitization. Still, these responses imply the positive attitude of workers in that they are willing to work more efficiently to facilitate digitization.

Digital competency is another aspect that is indispensable for digitization. Although digitization does not involve highly specialized techniques, it still seems challenging for workers of a particular generation. Respondents wrote that digitization is 'difficult for older workers,' or 'some of the older workers had difficulty.' The primary problem that appears here is the mismatch between the competency of traditional museum workers and newly emerged digitization work. Most of the respondents solved this problem by hiring new workers: 'a young person has come to the museum'. Successful digitization often requires additional suitable workers. Notably, competency in this context indicates elementary knowledge of computers.

The imbalance between workload and human resources for digitization is a notable factor as well. Even when a museum already has the equipment and eligible workers, how they manage digitization is also essential. Some responses indicated that digitization is an 'additional workload' for some workers. The amount of work per person increases because the number of workers did not increase. A more detailed response indicates the situation precisely, 'at the moment, we have to do all the work with two workers: educational programs, projects, evaluation, events, and so on.' Many answers also indicate that there is a 'lack of

human resources.' Digitization would have destroyed the balance between workload and human resources in some museums.

Sufficient equipment, suitable workers, and an adequate workload support staff while working on digitization. However, these elements are beyond the workers' control. In other words, some museum specialists face digitization problems because the prerequisites for digitization work is not fulfilled. On the other hand, the responses have a positive side: despite the question being asked about objections or complaints, many of the respondents seem to have a positive attitude regarding digitization. Still, these responses are from the perspective of managers; there might be potential difficulties that are not yet obvious or recognized by the respondents.

Challenges for a Museum as an Organization

A museum is an institution, and digitization is a process carried out within that structure. Thus, not only personal challenges but also structural challenges matter when museums begin to digitize. The second free-description question is Q2-2, 'What are the current challenges of digitization in your museum?' Out of 50 respondents, 39 described their challenges, three answered that they do not have any, and eight did not write anything at all. This section will analyze the difficulties mentioned by the 39 respondents. The majority of responses indicated the lack of minimal requirements for digitization. Roughly, they might be summarized as 'lacking financial resources,' as one respondent wrote. However, to understand their challenges in more depth, this section will analyze the consequences of a lack of financial resources. The responses imply three categories: lack of equipment, lack of human resources, and lack of specialized departments. Due to the nature of the free-description question, some responses fit into several independent categories. Moreover, responses that did not fit into any categories will be analyzed as well.

The dominant problem is a lack of equipment, which reflects the same difficulties regarding personnel. Notably, they often do not have the means to get a good quality digital image of their collection; a 'camera' or 'a large scanner' was lacking. Otherwise, 'there is a lack of funds to upgrade and expand the technical base,' or even a 'photo studio' is lacking. One respondent mentioned that they survived with aid from the LIMIS center: 'specialists from the LIMIS center arrived in 2017 and took photos of 300 exhibits.' Equipment that meets the specific requirements for digitization is not enough because they did not have enough financial resources.

People are essential for museums to carry out digitization work. One respondent wrote that a 'lack of human resources' is a problem. However, the majority answered more specifically that they do not have 'specialists,' and there are two issues related to this lack of specialists. One aspect is a shortage of resources to employ specialists dedicated to digitization, that is, an 'employee that would [do] only digitization work' is not sufficient. Thus, it was found that 'Digitization is carried out by four museum workers while performing other tasks according to their job requirements.' Another issue is the more specific lack of 'IT specialists' or a 'photographer.' The willingness to work on digitization matters, as referred to in the previous section, but the expertise to accomplish the task at a higher level is also required. Both quantity and quality are organizational obstacles for further digitization.

A digitization department would be necessary for a museum to undertake digitization properly. As discussed in the previous section, none of the museums have a specialized digitization department. Some respondents wrote that it is problematic not to have a digitization section in their organizational structure. One respondent answered that one of the challenges is that there is 'no computation section'. No respondent answered that a lack of a digitization department is the only difficulty; indeed, it always comes with a lack of equipment. In one respect, the department in this context represents a budgetary source with which to get equipment. On the other hand, the department itself might be regarded simply as a source of equipment for digitization.

Not all hardships mentioned were concerned with lacking something. A couple of museums found that using LIMIS is somehow inconvenient. One accurately described how it was 'not protected from cyber hacking, a very uncomfortable, often tense and distorting data

system'. Another wrote about the challenges of metadata and copyright. Preparing detailed metadata requires scientific research as copyright issues prevent museums from publishing data online. These issues require specialists beyond the digital field, such as lawyers and researchers.

The challenge of digitization from the perspective of a museum as an organization is to have specialized equipment, workers, and departments. These challenges indicate that most of the respondents feel that they are not yet adequately prepared for digitization. More importantly, since these problems are due to a lack of financial resources, and respondents represent municipal museums, these might not be solved easily unless the management level of museums changes their policy, or the local government changes the financial policy for museums. Furthermore, these problems infer a tendency of respondents' behavior: they are mainly considering digitizing within their museum and not thinking about outsourcing.

Discussion: The Three Phases of the Digitization Process

The questionnaire revealed that many respondents are facing difficulties. The responses to the free-description questions, in particular, indicated what elements were challenging in each institution. This section will discuss the difficulties at the personnel and organizational levels analyzed in the previous section, in order to understand the challenges. Further discussion will consider the difficulties, analyzed in the previous sections, from another perspective: the phases of the digitization process in museums. The first phase is to accomplish the minimum requirements for launching digitization operations, the second is the pursuit of quantity, and the third is to improve the quality of digitized data.

The first phase involves preparing the minimum requirements with which to launch digitization. The goal of this phase is to digitize at least one exhibit. Since all the municipal museums have already digitized a single object as of 2017 (Fig. 7), this phase was not a problem for respondents at the time of the survey. The requirement is to prepare tools for generating a digital image and let the personnel start using these tools. The tools include computers, and the ability to use them is indispensable for digitization. Furthermore, a digital camera and scanner are also essential requirements. The 'environment' and 'competency' difficulties, shown in the analysis of personnel difficulties, represent this phase. A museum can overcome the first phase when they purchase the tools and workers digitize a single object.

The next phase is to assure the digitization of a certain quantity of objects. Since the aim of digitization is not the process itself but to publicize or to manage a collection (Fig. 6), the more digitization is carried out, the better. Nevertheless, not every museum is constantly digitizing every year (Fig. 8). Because digitization is a manual process, it is time-consuming. Not only statistics but also some responses to the questionnaire indicate this to be an issue. The 'workload balance,' shown in the analysis of personnel difficulties, and the 'human resources,' shown in the analysis of organizational difficulties, represent issues for a museum of this phase. To get over this phase, it would be crucial to change human resources management to enable workers to work more on digitization.

Another phase in the digitization process involves the pursuit of quality. Notably, the quality of the digital image of museum exhibits was the main issue for some museums. Unlike the previous two phases, this phase entails technical and technological challenges. Typical examples include the anticipation of some respondents to have a 'photo studio' or a 'photographer' in their institution. However, this means that enabling better quality digitization is expensive and seems to be unaffordable for most respondents. The difficulties surrounding a 'lack of equipment' and 'lack of human resources,' shown in the analysis of organizational challenges, represent this phase.

Regarding the quality of the data itself, important indications were given in the non-categorized responses to organizational difficulties. Metadata is an essential factor in digitization. Accurate information is necessary for a trustworthy database; however, copyright issues prevent some data from being published and affect the whole database's quality. Nonetheless, these are not yet identified as significant obstacles for the respondents.

The difficulties of digitization in Lithuanian municipality museums, discussed above, are mainly the inadequacy of hardware and human resources. In other words, software,

or an information management system for digitization, was not referred to. Because of the LIMIS, the museums did not have to spare resources to purchase or develop software for data management. It will be a challenge for a museum to prepare a system for digitization if there is no standard system. Still, LIMIS itself might become a challenge after a while, as one respondent indicated in reference to its issues.

The analyses of the difficulties of digitization in Lithuanian municipal museums lead to three linear-like phases: basic requirements, quantity, and quality. Notably, pure technological requirements only appear in the third phase, while the first two phases demand structural improvements. Moreover, these difficulties do not include region-specific challenges, indicating that they may apply to museums in a similar situation in other regions. These three phases, then, answer the research question of this article, namely regarding the challenges museums face for digitization.

Conclusion

This paper explored the difficulties of digitization in Lithuanian municipal museums. The data collection methods were the questionnaire survey and official statistics. Both quantitative and qualitative data were analyzed in order to examine the research question. Out of 54 Lithuanian municipal museums, 50 responded to the questionnaire. Quantitative data and qualitative data were analyzed independently and discussed accordingly.

Responses to multiple-choice questions showed the current situation and behavior toward digitization of each respondent. The policy of computer usage, personnel responsible, and even the objectives of digitization are not the same in all museums. Besides, the official statistics indicate that all Lithuanian municipal museums started digitizing before 2017, though not all were continuously digitizing every year. On the other hand, analyses of qualitative data – the free-description answers to the questionnaire – revealed difficulties in digitization in museums at the personnel and organizational levels. For staff, faulty equipment, lack of competency, and increased workload are the main challenges. In contrast, institutional level difficulties concern a lack equipment, personnel, and structural reform due to inadequate funds.

A discussion of the research results leads to identifying the first three phases of digitization in museums: accomplishing minimum requirements, pursuing quantity, and attempting better quality digitization. These phases indicate the procedure of how a museum works on a new task. The first phase, basic requirements, represents the launch of a new project. The second phase, quantity, represents the continuation of the project by adjusting the daily work of personnel. The third phase, quality, represents technical improvements. Considering the quantitative data analyses, Lithuanian municipal museums are currently in the second or third phase.

Although all Lithuanian municipal museums had already started to digitize, not all of them could continue steadily. Thus, acceptance of digitization is not merely about using new devices but also about changing the way people work in museums. The professional usage of an innovative machine will not be a solution until museums have adjusted their structure and adapted to a new way of working. This result explains why museums appear to be considerably slower in adopting innovations despite the rapid explosion of digital technology in society. The primary obstacles to digitization that museums face are not technological issues but their structures.

Notes

[1]   In the field of natural science, digitization for 'open access to images and specimen data' has the potential to mitigate the unequal distribution of extensive science collections, improve researcher diversity and augment both formal and informal science education at the secondary and tertiary level (Drew et al. 2017: 1789). On the other hand, research on the Norwegian digital platform DigitaltMuseum indicates that 'online museum platforms create new options for cultural policymakers' (Gran *et al.* 2019: 75). These studies emphasize the advantages of digital objects, such as the excellent accessibility for museums.

[2] The impact of digital objects in museums is challenging to measure other than by metrics or analytics such as 'numeric totals of downloads, clicks, hits, and "likes"' (Marsh *et al.* 2016).

[3] Categorizing users of digitized materials is one way to understand the impact or user intention (Falk and Dierking 2016: 50; Villaespesa 2019). Digitization and digital objects in museums serve various groups of stakeholders, including researchers and online users.

[4] Earlier researches into digitization show technological options. One approach was for better-quality two-dimensional images, especially of natural history collections. Assessment of image quality by low-cost, compact digital cameras offered better digitization by volunteers (Mertens *et al.* 2017). A new scanning system and crowdsourcing were proposed for industrial-scale digitization (Blagoderov *et al.* 2012). UV exposure for two-dimensional imaging beyond human eyesight was also tested (Brecko *et al.* 2016). Another approach is processing three-dimensional images. Photogrammetry by a new scanner enables automation of the three-dimensional imaging of small and delicate cultural objects (Marshall *et al.* 2019). A case study of the Galleria dell'Accademia di Firenze in Italy examined the possibilities of a BIM (Building Information Model) to digitize both the art gallery building and its collection (Tucci *et al.* 2019). These studies of technical improvements for museum digitization adapted devices and systems for specific usage in museums.

[5] According to EGMUS (European Group on Museum Statistics), in only a few countries do over 80 per cent of all museums have a database for electronic inventory (EGMUS, 'EGMUS - Complete Data'. https://www.egmus.eu/nc/sl/statistics/complete_data/, accessed: 1 November 2021.). However, as of 2021, digitization-related statistics are not yet available at the international level.

[6] Lietuvos dailės muziejus, 'Pradinis - LIMIS'. https://www.limis.lt/pradinis, accessed 6 September 2020.

[7] All Lithuanian public museums are obliged to submit an annual report to the Ministry of Culture. The statistics are based on the submitted data and published by the Ministry of Culture on its webpage (Lietuvos Respublikos Vyriausybė, 'Muziejai ir galerijos - Lietuvos Respublikos kultūros ministerija'. http://lrkm.lrv.lt/lt/veiklos-sritys/muziejai-ir-galerijos, accessed 6 September 2020). Statistical data from each year are directly downloadable from the web page of the Ministry of Culture in the format of Microsoft Excel files. Since each statistical file does not have a unique URL, this paper will refer to the website as a source of statistical data.

[8] Lietuvos dailės muziejus, 'Pradinis - LIMIS'.

[9] The Ministry of Culture of the Republic of Lithuania, 'The Approval of Digitization of Lithuanian Cultural Heritage, Storage of Digital Content and Access Strategy [Dėl Lietuvos kultūros paveldo skaitmeninimo, skaitmeninio turinio saugojimo ir prieigos strategijos patvirtinimo]'. https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.345065/ZlOtDvBSRq, accessed 19 December 2019.

[10] The Ministry of Culture of the Republic of Lithuania, 'The Approval of Digitization of Lithuanian Cultural Heritage, Storage of Digital Content and Access Strategy'.

[11] Lietuvos dailės muziejus, 'Pradinis - LIMIS'.

[12] Lietuvos Respublikos Seimas, 'Museum Law of the Republic of Lithuania [Lietuvos Respublikos muziejų įstatymas]'. https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.18317/asr, accessed 19 December 2019.

[13]   The questionnaire was distributed and collected while Kimura conducted the questionnaire survey (Kimura 2018). The questionnaire for this study was distributed only to the municipality museums, although the subjects of the study by Kimura were all the public museums in Lithuania (Kimura 2018).

[14]   See Lietuvos dailės muziejus, 'Pradinis - LIMIS'.

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