

Digitizing with a mobile phone system: a contribution

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Abstract

This article aims to present the experience gained during the development and implementation of a digitization system for cultural heritage collections using a cell phone. This project was developed in four stages: search and creation of the system, training of professionals assigned to operate the equipment, writing the guidelines that summarize the knowledge obtained and, finally, monitoring the results and disseminating the digital surrogates via Wikimedia.

The digital team of the Moreira Salles Institute developed this project in partnership with Institute Goethe and Wiki Movimento Brasil between October 2021 and February 2022. The main goal is based on the understanding that different digitization methods can meet different needs and resources that are available for cultural heritage institutions, and the goal of democratizing knowledge and contributing to public access to collections of fundamental importance for Brazilian history.

Why digitize with a cell phone?

When a cultural institution, a museum or an archive begins to define the digitization system that will be adopted, the professionals responsible for the choices that will be made in this process are faced with a series of questions such as, for example, what resolution the images should have, what is the cost of the system and long-term digital preservation, what are the results obtained in relation to file size, color fidelity to the physical original, necessary learning time for the team that will operate the system, should there be several systems to reach distinct goals, among others.

To create a digitization program that is viable and sustainable over the years, these choices must be made considering the financial and human resource possibilities of each institution. Systems that use high resolution equipment can never be replaced by a cell phone capturing system, but it is necessary to consider that in many cases the acquisition of high-quality cameras, such as medium format cameras, is not an option for many institutions throughout the world mainly due to the high costs. In cases where this occurs, digitization is not performed at all, as the lack of funds to acquire this equipment becomes a limiting factor for carrying out the work itself.

In general, what motivated the elaboration of this project was the urgency to create mechanisms that meet the cases in which a high-resolution digitization is not feasible. Developing a system in which a person with little to no background in photography could perform, in a simplified and low-cost way, would be an alternative to allow digital access and, even so, obtain a satisfactory result. In addition, the files generated by the cell phone are smaller compared to the files generated by a professional camera, which facilitates

large-scale transfers and reduces the need for storage space, thus allowing for more sustainable results.

The beginning

When the COVID-19 pandemic was announced and the first lockdowns were put in place, the work routine in museums and collections had to be modified. Remote work began and the digitization team, without being able to access the originals, began to trace the first lines of what would become this project. As the months passed, it became increasingly evident, within the universe of museums and cultural institutions, that the availability of their own content online has become something essential in the new global scenario. In this way, research on this project was initially established as a remote work strategy, including to make it possible to meet these new demands, and then, when face-to-face work began to be resumed in parts, it began to be experimented with and put into practice.

The first initiative to materialize these studies took place through a simplified prototype which we called the Compact System. The goal was to get a readable image from folders that contained type written names, so that it would be possible to automate these files through an OCR process, extract this text and create a database with all the written names. The responses of the staff involved operating and supervising this initial model was fundamental for us to be able to check in which aspects the system needed to be improved, working like a good case study.

The Portable Museum project began, then, with the knowledge obtained by the Moreira Salles Institute team from its internal demands and with the collaboration of partner institutions: *Institute Goethe, Wiki Movimento Brasil, Santa Casa da Bahia* and *Museu da Capitania de Ilhéus*. The Portable Museum project had in mind, since its initial stages, the elaboration of a compilation of guidelines that would be the product of the knowledge gathered during the research and the execution of the system, and that would be widely disseminated on the web, being made available through Wikimedia.



Figure 1. Guideline's cover

Starting from considerations about the specifics of the collection to be digitized, we established criteria for the choice of equipment such as good cost-benefit ratio, options for applications and software, preferably open source and more accessible, equipment that could be arranged in different configurations and that were easy to operate. We carried out several tests and arrived at a system to be used, which basically consisted of a cell phone with a 48-megapixel camera, two Ring Light-type lamps with tripods, a smart watch used as a remote trigger, and software for transferring files and for basic edits to images.

This set of equipment was gathered in a Kit format and donated to two institutions: *Santa Casa da Bahia* and *Museu da Capitania de Ilhéus*. Among the collections selected to be digitized through this system, we highlight the *Livros de Banguê*, a series of books produced between 1742 and 1856, consisting of historical records of the mortuary service of enslaved Africans. The set of these works, belonging to the Jorge Calmon Memory Center of *Santa Casa da Bahia*, was awarded by UNESCO the “Memory of the World” category and its content had not yet been publicly disclosed in its entirety.

Step by step: the development of the project

To meet the demands of digitization and considering the specifics of the works selected for this project, we created two possible system arrangements with the use of the cell phone. Those arrangements were developed to meet predefined collections. For the two-dimensional objects no wider than 50 centimeters, and three-dimensional objects no wider than 40 centimeters.

The guidelines included photographs illustrating, with instructions, on how to set up the workspace, following a caption that indicated each aspect to be taken in consideration. For example, a space reserved for handling the originals and the correct

positioning of the lights and cell phone. For the collection of three-dimensional objects, we created two possible lighting arrangements. One system with two LED panels that were included with the small studio box, model sold by the company *Mutu*, intended for commercial photography. The other system using the same ring lights utilized for photographing the two-dimensional collection.



Figure 2. Workspace for two-dimensional items (page extracted from the Guidelines)



Figure 3. Workspace for three-dimensional items using the LED panels included in the studio box (page extracted from the Guidelines)



Figure 4. Workspace for three-dimensional items using a ring light (page extracted from the Guidelines)

With the aim of obtaining the best quality for these images within the possibilities that the resources available offered, we included also in the Guidelines document tips on the assembly and adjustment of the equipment. A few of these tips we mention here: position the lights and the cell phone symmetrically to each other and in relationship to the original; using bubble level apps for the cell phone to verify parallelism between the planes of the 2D objects and cell phone; ensure that users capture the images with the cell phone in landscape orientation from the first shot as this will facilitate the workflow process.

Information on the models of the equipment used to assemble the kit, including their values, were made available also in the Guidelines document. The total purchase amount in December 2021, which includes all items necessary to assemble the 2D and 3D systems, notebook, and external HDD, was R\$7,330.00 (approximately US\$1,354.00).

For the workflow, we created a flowchart to visualize the processes in a step-by-step way. We know that the job is far from finished with just the images captured, so we added in the guidelines some basic notions about the postproduction stages. These include transferring the files from the cell phone to the computer, batch renaming to assign codes according to institutional policies and with some information that refers the sequence of the original, front, back, and different angles, and image processing with basic image settings, insertion of metadata and, finally, the digital storage and access methods, following principles for digital preservation.

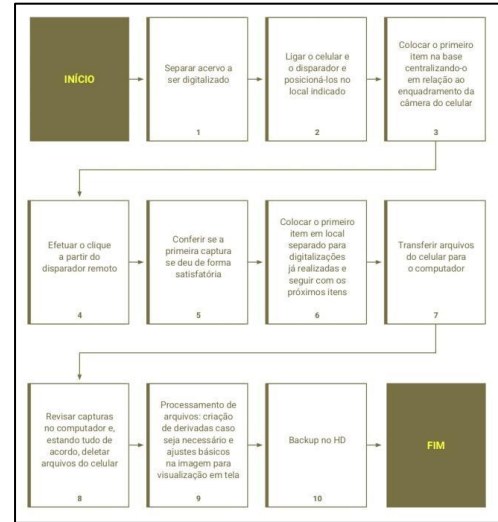


Figure 5. Flowchart (page extracted from the Guidelines)

In the end of the Guidelines document, we included the criteria used to select the equipment, condensing important information that could be used to guide those having to make choices for each item in the kit, to give more autonomy to future users and builders of these kits, as technology changes. For cell phone choices, we indicate that it is important to give preference for models with good processing, internal storage systems, *Android* operating system, camera options that allow for white balance and exposure time adjustments, among others. Some of the criteria to take into consideration for choosing light sources, cell phone stands, neutral background materials, notebooks and software were also cited.

For the museums to perform the upload of their images and metadata on Wikimedia, two online training days were done with professionals from Wikimedia. The teams from each institution then did all the input of their images on Wikimedia. This project is part of an initiative that aims to share knowledge freely. For this purpose, the entire collection available online is of materials that are in public domain. All other materials produced by this project have been released with a CCO license.

Results obtained so far

One of the greatest contributions that this project has been able to demonstrate so far is the public domain access on the web to highly relevant documents that refer to the memory of slavery in Brazil. The work on digitizing the collection destined for this project is still ongoing, but several hundred images referring to the *Banguê* book, for example, have already been uploaded.



Figure 6. Two pages from the Banguê Book

The experiences obtained during the training course of this project were used to create a table at the end of the Guidelines document of frequent problems and possible solutions for these problems. As an example, we can mention here the lack of uniformity of the emitted light by the ring lights depending on the distance in which they are allocated in relationship to the objects photographed. The solution found in this case, which has been shown to be effective, was the installation of a diffuser using highly reflective material put in the hole of the ring light.

Because this project is based on adapting equipment that was not created for the purpose for which we are using, it is still necessary to continue to improve and present better solutions for other obstacles that were noticed along the way, as is the case with the color variations that show up between photographs. We are now working on the use of a spectrophotometer to build inexpensive *color charts* and looking at ways to circumvent the cell phones to achieve more precise color reproduction, and RAW image capture. These are some of the issues that will be included in our second version of the Guidelines, in addition to research on the cell phone lens market, especially polarizing and macro lenses, and other tools that have the potential to contribute to the improvement of the system.

Another important gain of the research involved in this project was the creation of a versatile system that can be adapted to be used with different types of collections, as was the case of the three-dimensional pieces that were digitized in the system created for the *Museu da Capitania de Ilhéus*. In this image below we can notice, despite some details that can be improved, a very satisfactory result. We must also take into consideration that the professional who operated this system had no background in photography, that the training devoted to teaching the use of the system was done in a few days, and the low production costs.



Figure 7. Miniature lamp from the Museu da Capitania de Ilhéus archive

The entire project was developed with the aim of generating autonomy and empowerment of cultural heritage institutions through the complete control of the entire production chain, from the possession of the equipment, through the assembly of the system, execution of the captures, processing of the images, taking measures for backups and digital preservation, and even the dissemination phase through Wikimedia. The collections available on Wikimedia are inserted with various information in their metadata, which facilitates the search in this virtual encyclopedia of great prominence, used on a large scale in dozens of countries around the world.

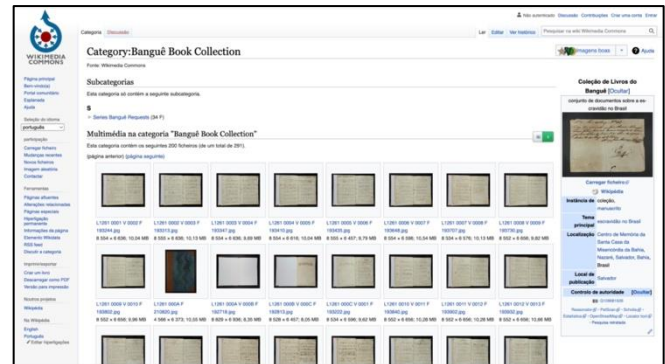


Figure 8. Banguê Book Collection available in Wikimedia

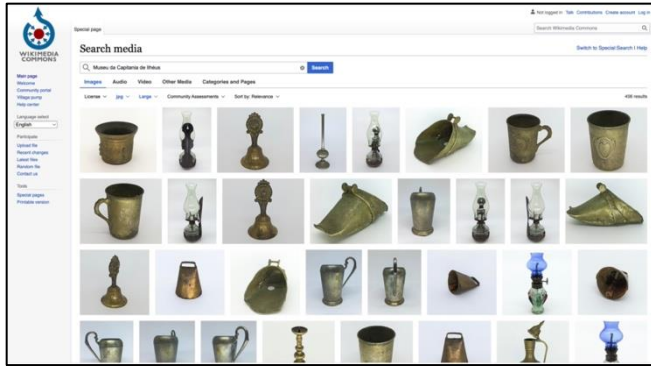


Figure 9. Digitizations from the Museu da Capitania de Ilhéus archive available in Wikimedia

Author Biography

Marcele de Oliveira Gonçalves works with digitization of collections and file processing at the Digital Team of Moreira Salles Institute. With a master's degree in History from the Universidade Federal Fluminense, she has experience in archives as a researcher and photographer of cultural assets. She developed, together with her team, the Portable Museum system, and the writing of the guidelines for digitization using a cell phone.

A path under construction

The initiative to create this project was inspired by useful models such as the *Carta do Recife*, created by the *Rede Memorial*, and the *Archivist in a Backpack* project, created by the Southern Historical Collection of the University of North Carolina at Chapel Hill, important examples of democratization of knowledge about digitization, preservation, and dissemination of collections and knowledge.

Many stories are silenced and fall into oblivion when institutions that hold important resources in their collection do not have access to specialized knowledge and expensive equipment for digitizing these documents under their protection, and make them available, known and researched. With this project it is possible, in a more accessible way, to create mechanisms to give visibility to these historical sources that faced difficulties in being digitized by an infrastructure of few resources. In the Brazilian context, this system has the potential to be transformative, as it allows the awakening of the interest of cultural institutions in real possibilities of implementing obtainable methods that effectively contribute to the digitization, access, and dissemination of their collections, respecting the context of the socio-economic realities that these institutions are embedded in.

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