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The Effectiveness of VBA-based File Management

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Abstract

File management is the process of organizing, storing, and manipulating digital files on a computer system. Several key aspects such as documents can be easily accessed, protected in terms of authenticity, and managed efficiently are criteria for good physical and digital file management. In addition, by implementing a good file management, archives can be easily and quickly retrieved again when needed, classified clearly, named consistently for easy tracking, protected from loss and damage, and maintained their authenticity for valid evidence. Not only that, the scalability of file management can also be developed according to future document growth, is adaptive to business needs, and sustainability maintained. This study aims to create and measure the effectiveness of a VBA-based File Management Application as a file mitigation effort in the Digital Era. This study uses action research and functional black box testing methods. The results of this study indicate that the VBA-based application created has met the criteria for good file management, namely easy to use, creates and stores documents securely, easy to trace back, reliably protected in terms of authenticity, and all its functions run as expected. This application is expected to be evaluated and monitored regularly during the implementation for further development.

Keywords: file Management, VBA, file mitigation, digital era.

INTRODUCTION

Good and effective file management is very important in today's digital age because it determines how easily and quickly an organization or individual can access and retrieve previously created files. Every digital file that is created and stored must be handled

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properly because it is often difficult to identify and retrieve files when they are not stored in a coherent storage structure consisting of directories and subdirectories. File management can make this process more effective and efficient and ensure that documents are always available when needed. This is particularly beneficial for individuals and organizations of all sizes, especially those that manage large volumes of files.

Previous studies found that file management could be used to store document metadata (Storey, 2019), manage incoming and outgoing mail (Churiyah et al., 2019), store digitized documents (Fad'li et al., 2023), manage cloud-based mail (Darmansah et al., 2024), manage incoming and outgoing documents resulting from media conversion (Azzahrah et al., 2024), and manage business files resulting from media conversion (Darmansah et al., 2024). All these studies also proved that file management could simplify and accelerate the retrieval of stored files, reduce and prevent file damage or lost, and manage files more effectively and efficiently.

Previous research findings also prove the importance of document management applications in the digital age. File management applications in the form of archive digitization have proven to be very useful in improving the efficiency of archive management, which takes up a lot of space, time, budget, and energy in conventional systems. Digitizing archives also speeds up the service process for archive creators (government, organizations, or individuals) and archive service users. Previous researches have also found that good digital document management in the digital age can improve performance and services for those who need them.

Even though there are many benefits to be gained from good digital file management, nowadays there are still many companies, agencies, organizations, institutions, and even individuals who have not implemented good file management practices. Mainly the ones that meet the standards set by the National Archives of the Republic of Indonesia (ANRI), both in relations with facilitative and substantive functions attached to them. Two main things that have not yet been done by archive creators based on ANRI standards are naming folders or subfolders (directories) and naming the digital files that are created and stored. Another thing that is still often done by archive creators is that when creating archives using old document archives, they do not realize that this can damage the authenticity of the document or even destroy the original document. This fact certainly requires an appropriate solution and not too burdensome in terms of budget. Especially for private organizations or individuals who have not yet implemented the Integrated Dynamic Archiving Information System (Srikandi), Dynamic Archiving

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Information System (SIKD), Electronic Official Document System (TNDE), or Electronic Official Document System (SINDE) applications.

The objectives of this research are:

1. To create a VBA-based file management application that complies with ANRI standards
2. To test the effectiveness of the VBA-based File Management Application

LITERATURE REVIEW

File Management

According to (Malak, 2024), file management is the process of organizing, storing, and manipulating files that makes them easily accessible on a computer system. This process involves creating an organized file storage structure and using computer storage devices, such as offline and online drives, to store information (Sutirman, 2019). By using effective file management application, it is possible to reduce the problems of finding the needed files, improve performance, and increase the productivity of an organization. Good file management can be used to find and retrieve the desired files easily, ensure data security, and optimize the use of storage space. The process of identifying and storing files must be carried out carefully within a logical structure consisting of directories and subdirectories. Every digital file must be handled and stored appropriately within the system as it will save time when searching for the required resources.

File management in a computer allows full control over your most valuable digital assets through key file management components by creating digital folders and subfolders to facilitate long-term file management, backup, and file access when needed (Wijaya et al., 2024). File management can also be used to maximize digital file collections by applying good file and folder naming techniques, as well as solid metadata practices. Thus, it can be summarized that file management is a systematic process for organizing, storing, and controlling digital files to ensure that file access, retrieval, and maintenance are carried out effectively and efficiently, enabling archive creators to easily create, edit, delete, and find data in a structured system for optimal productivity and data integrity.

There are three main components of file management in an operating system (OffiDocs, 2023):

1. Storage, which is the component that determines how files are stored on a computer, external hard drive, or in the cloud so that they can be easily accessed and reused when needed.
2. Organization, which is the component that deals with how to organize the creation of folders and file naming to facilitate file storage and retrieval.

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3. Protection, which is the component that deals with how to protect data from damage or loss (security).

The following are some of the benefits of managing files using the right application, according to (Armstrong, 2023):

1. Streamlining Processes

   File management that is used to help store and organize digital files can streamline many administrative processes.
2. Protecting Documents

   Good file management can keep documents safe by using protection to access files or documents.
3. Stored in One Place

   File management functions as a pseudo-archive. All information needed for a topic, subject, or project is centralized in one convenient location. File management application can be used to create file hierarchies. A file hierarchy system is a way to compartmentalize file choices into folders based on topic.
4. Saves Resources.

   Many existing documents must be recreated simply because they cannot be found in the company's system. Recreating documents often takes a lot of time, and for more complex documents, it can take days. A file management system helps keep files and documents well organized, which means existing files can be found more easily, saving time in the process.
5. Improved Communication (Metadata)

   Many file management systems come with features to help with internal communication within an organization. File management systems can also store conversation histories and track changes so that every change to a document can be understood and remembered why it was made.
6. Maintaining Document Versions

   When documents are accessed by many people within an organization, it can be difficult to know which version of the file is the latest. However, when a file management system is implemented, it automatically controls which version of the document is the latest.

Archive Classification

According to the Regulation of the National Archives of the Republic of Indonesia Number 9 (2022) concerning Classification of Archives within the National Archives of the

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Republic of Indonesia, classification of archives is a pattern of arranging archives in stages from the results of the implementation of the functions and duties of agencies into several categories of archival information units. Archive Classification is carried out primarily in relation to preparing Folders/Subfolders in the Logical Hierarchy. Archive classification must be arranged in accordance with technical provisions consisting of 1. logical; 2. factual; 3. continuous improvement; 4. systematic; 5. accommodative; and 6. chronological; and grouped based on the main functions and duties of the archive creator, which include facilitative and substantive functions (Nikmah et al., 2022).

In determining the archive classification, the creator of the archives can choose a flexible coding system according to their needs, consisting of 1. numbers (numeric); 2. letters (alphabetic); or 3. a combination of letters and numbers (alphanumeric). The writing technique of archive classification contains at least the elements of complete archive classification, including serial numbers, classification codes, main subject titles, sub subjects, and sub-sub-subjects.

Archive classification can be used as a guideline for organizing archives so that they are able to record and reconstruct activities in a complete and factual manner from the implementation of organizational activities. The following is an example of a numerical archive classification scheme based on issues according to the Regulation of the Head of the National Archives of the Republic of Indonesia Number 19 (2012) concerning Guidelines for the Preparation of Archive Classification:

Name of Institution
1. Function/F1 (main issue/primary)
1.1. Activity/A1 (secondary issue)
    1.1.1 Transactions/T1 (sub-sub issues/tertiary)
    1.1.2 Transactions/T2 (sub-sub issues/tertiary)
1.2. Activity/A2 (secondary issue)
    1.2.1. Transaction/T1 (sub-sub issue/tertiary)
2. Functions/F2 (primary issues)
2.1. Activities/K1 (sub-issues/secondary)
    2.1.1 Transactions/T1 (sub-sub issues/tertiary)
    2.1.2 Transactions/T2 (sub-sub issues/tertiary)
2.2. Activities/K2 (secondary sub-issues)
    2.2.1 Transaction/T1 (sub-sub issue/tertiary)

The following are examples of archive classification coding:

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Example for Numbers:
100 (for example, to represent the personnel function group).
900 (for example, to represent the finance function group).
Examples for Letters:
KP (e.g., to represent the personnel function)
KU (e.g., to represent the finance function)
HK (e.g., to represent legal functions)
Examples for Combination of Letters and Numbers:
KP.00 (e.g., to represent employee recruitment activities)
KP.01 (e.g., to represent employee appointment activities)

The classification codes are arranged to be used later as names for folders and subfolders (directories) on file storage media.

Visual Basic for Applications (VBA)

According to (Raharjo, 2021), Visual Basic for Applications (VBA) is a programming language integrated into Microsoft Word, Excel, Access, or PowerPoint, which allows you to automate everything in these applications. The purpose of VBA is to automate tasks. These tasks are repetitive and complex. VBA differs from Microsoft Visual Basic (VB), which provides many advanced programming and functions.

VBA can only be built into the main Microsoft Office applications by controlling the functions of those applications to perform a series of programmed objects. The VBA programming language is also used to develop user-defined functions, access the Windows API, and other low-level functions. Microsoft Word documents can be developed automatically using VBA. VBA is installed in many Microsoft Office applications, such as Mac OS X and various other applications. The advantage of VBA is that it does not require Visual Basic to be installed on the Windows operating system.

The following are common uses of VBA macros (Mansfield, 2016):

1. Automating frequently performed tasks
2. Automating repetitive operations
3. Creating custom commands
4. Creating custom toolbar buttons
5. Creating custom menu buttons
6. Creating a simplified front end
7. Developing new worksheet functions
8. Creating a complete application driven by macros

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Some advantages of using VBA (Mansfield, 2016) are:

1. Enables the automation of tasks by performing them with the help of VBA macros. This can be achieved simply by writing instructions.
2. Enables tasks to be performed consistently.
3. Performing tasks much faster than manual processes.
4. Saves time and effort.

Black Box Testing

Black box testing is a software testing method that focuses on testing software functionality without considering the internal structure or program code (Fauzi & Yunial, 2025). Black box testing can detect several issues such as incorrect or missing functionality, data structure errors, database access errors, interface errors, performance and initialization errors, and so on. There are three common types of black box testing (Narendra, 2025):

1. Functional testing

   Functional testing is conducted by checking and reviewing the functions of the software being tested. This includes checking the performance and features available in the software.
2. Non-functional testing

   Non-functional testing serves to review additional features in the software. The goal is for testers to determine whether the application is optimal or not.
3. Regression Testing

   Regression testing serves to review whether there is a downgrade or deterioration in the upgraded or updated system.

Advantages of Black Box Testing

1. No programming language is required.
2. Testing is conducted from the user's perspective, and the results can help identify various inconsistencies in the relevant applications.
3. Application testers no need to check structured code.

RESULTS AND DISCUSSION

Based on preliminary observations of this research related to business file management conducted in the MSME community of LinkSos, the following problems were identified:

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1. The creation of business files (documents) is still done conventionally without considering document security.
2. The creation of business files (documents) is still carried out without considering document authenticity.
3. The standard format for creating business files (documents) does not yet use template facilities.
4. Business documents created are still not stored in folders according to archive classification.
5. The metadata of the business documents created still uses standard metadata and does not utilize other metadata as material for file searches.
6. Searching for business documents is still not easy, fast, or accurate.
7. File naming when storing business documents does not yet comply with the Regulation of the National Archives of the Republic of Indonesia Number 6 (2021) concerning Electronic Records Management.

From the initial observation results, a VBA-based File Management Application was then created through action research stages and test cases were determined to test the effectiveness of the application as follows:



Figure 1: Welcome Page Interface

Figure 1 shows the welcome page interface of the application. In this interface, there are two test cases to be performed, i.e. Lanjut and Close buttons. The *Lanjut* button is used to display the *Membuat Dokumen Baru* interface. Whereas the Close button is used to close the initial application interface and exit the application.

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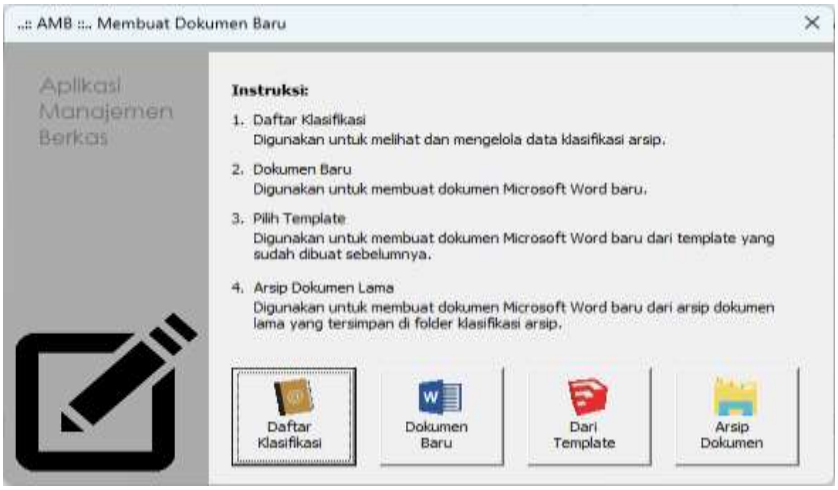


Figure 2: *Membuat Dokumen Baru* Interface

Figure 2 shows the *Membuat Dokumen Baru* interface. In this interface, there are four test cases to be performed, i.e. *Daftar Klasifikasi, Dokumen Baru, Dari Template*, and *Arsip Dokumen* buttons. The *Daftar Klasifikasi* button is used to display *Mengelola Daftar Klasifikasi Arsip* interface. The *Dokumen Baru* button is used to open a blank document in Microsoft Word. The *Dari Template* button is used to open the *Memilih Dokumen Template* interface. Whereas the *Arsip Dokumen* button is used to open the *Memilih Klasifikasi Arsip* interface.

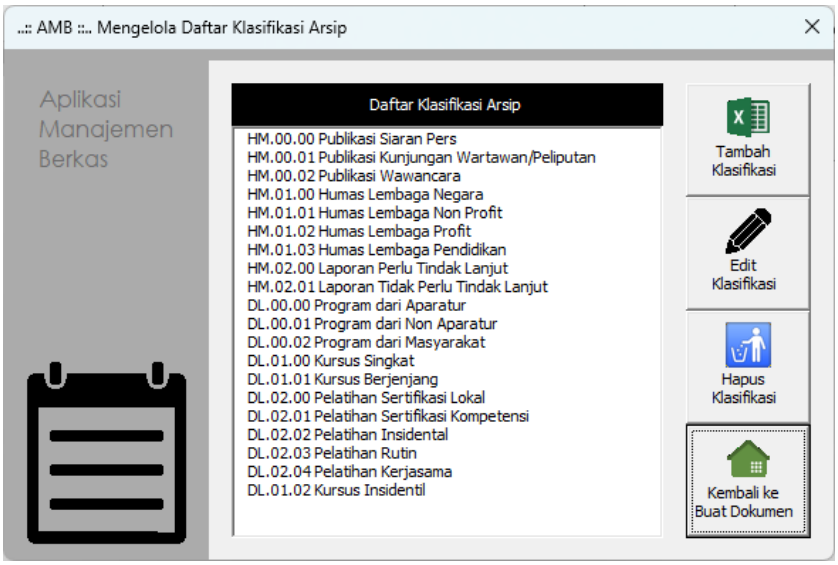


Figure 3: *Mengelola Daftar Klasifikasi Arsip* Interface

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Figure 3 shows the *Mengelola Daftar Klasifikasi Arsip* interface. In this interface, there are four test cases to be performed, i.e. the *Tambah Klasifikasi, Edit Klasifikasi, Hapus Klasifikasi,* and *Kembali ke Buat Dokumen* buttons. The *Tambah Klasifikasi* button is used to add a new archive classification in the *Daftar Klasifikasi Arsip*. The *Edit Klasifikasi* button is used to modify an existing archive classification in the *Daftar Klasifikasi Arsip*. The *Hapus Klasifikasi* button is used to delete an archive classification from the *Daftar Klasifikasi Arsip*. Meanwhile, the *Kembali ke Buat Dokumen* button is used to open the *Membuat Dokumen Baru* interface.

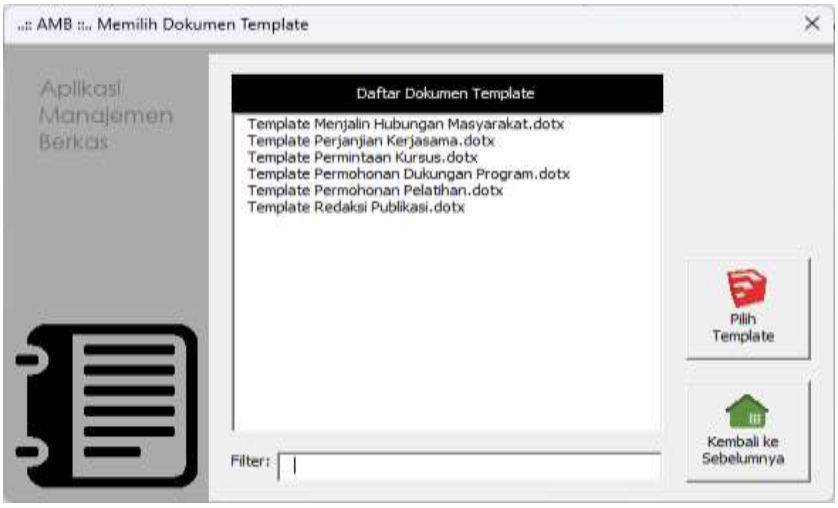


Figure 4: *Memilih Dokumen Template* Interface

Figure 4 shows the *Memilih Dokumen Template* interface. In this interface, there are three test cases to be performed, i.e. Filter Input, *Pilih Template*, and *Kembali ke Sebelumnya* buttons. The Filter input text box is used to search for document templates in the *Daftar Dokumen Template.* It is helped display a smaller number of document templates in the *Daftar Dokumen Template*. The *Pilih Template* button is used to open the selected document template in the *Daftar Dokumen Template*. Whereas the *Kembali ke Sebelumnya* button is used to open the *Membuat Dokumen Baru* interface.

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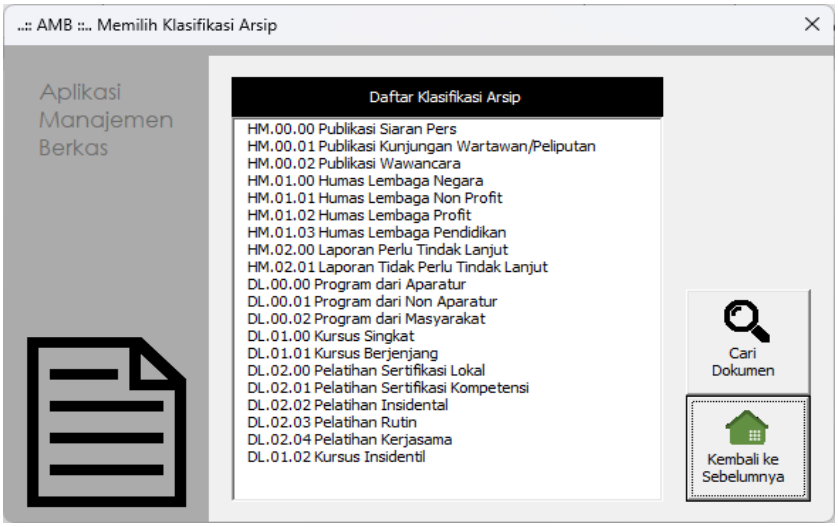


Figure 5: *Memilih Klasifikasi Arsip* Interface

Figure 5 shows the *Memilih Klasifikasi Arsip* interface. In this interface, there are two test cases to be performed, i.e. *Cari Dokumen* and *Kembali ke Sebelumnya* buttons. The *Cari Dokumen* button is used to search, select, and open archive documents in the classification folder according to the selection in the *Daftar Klasifikasi Arsip*. Whereas the *Kembali ke Sebelumnya* button is used to open the *Membuat Dokumen Baru* interface.



Figure 6: *Menyimpan Dokumen Baru* Interface

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Figure 6 shows the *Menyimpan Dokumen Baru* interface. In this interface, there are two test cases to be performed, i.e. *Simpan ke Template* and *Simpan ke Folder*. The *Simpan ke Template* button is used to save the newly created document as a template and save it into the template folder together with additional metadata entered on the interface. Whereas the *Simpan ke Folder* button is used to save the newly created document to a folder according to the archive classification and is equipped with additional metadata entered on the interface. If the classification folder does not exist, it will be created automatically by the system.

So, there are a total of 17 test cases from 6 interfaces that will be functionally tested using black box testing for the application's effectiveness. The following is a table of functional test results for 17 test cases using black-box testing:

Table 1: Black Box Functional Testing Results

Inter-face	Test Case	Test Phase	Expected Results	Test Results
1	1	1. Open File Management Application	The system displays the welcome page interface	The system successfully displayed the welcome page Interface
		2. Click ***Lanjut*** button	The system displays the *Membuat Dokumen Baru* Interface	The system successfully displayed the *Membuat Dokumen Baru* Interface
	2	Click **Close** button	The system closes the welcome page interface	The system successfully closed the welcome page Interface
2	3	Click ***Daftar Klasifikasi*** button	The system closes the *Membuat Dokumen Baru* interface and displays the *Mengelola Daftar Klasifikasi Arsip* interface	The system successfully closed the *Membuat Dokumen Baru* interface and displayed the *Mengelola Daftar Klasifikasi Arsip*

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Inter-face	Test Case	Test Phase	Expected Results	Test Results
				interface.
	4	Click ***Dokumen Baru*** button	The system closes the *Membuat Dokumen Baru* interface and displayed a new blank Microsoft Word document	The system successfully closed the *Membuat Dokumen Baru* interface and displayed a new blank Microsoft Word document
	5	Click ***Dari Template*** button	The system closes the *Membuat Dokumen Baru* interface and displays the *Memilih Dokumen Template* interface	The system successfully closed the *Membuat Dokumen Baru* interface and *Memilih Dokumen Template* interface
	6	Click ***Arsip Dokumen*** button	The system closes the *Membuat Dokumen Baru* interface and displays the *Memilih Klasifikasi Arsip* interface	The system successfully closed the *Membuat Dokumen Baru* interface and displayed the *Memilih Klasifikasi Arsip* interface
3	7	1. Click ***Tambah Klasifikasi*** button 2. The dialog box for entering a new classification is displayed 3. Input a new classification 4. Click OK button 5. The new classification is added to the *Daftar*	The system adds a new archive classification to the *Daftar Klasifikasi Arsip*	The system successfully added a new archive classification to the *Daftar Klasifikasi Arsip*

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Inter-face	Test Case	Test Phase	Expected Results	Test Results
		Klasifikasi Arsip		
	8	1. The system first asks to select an archive classification to be edited 2. Click ***Edit Klasifikasi*** button and the system will display a dialog box containing the archive classification data to be edited 3. Correct any errors in the archive classification data in the dialog box 4. Click OK button 5. The archive classification changes are saved in the *Daftar Klasifikasi Arsip*	The system corrects a selected archive classification in the *Daftar Klasifikasi Arsip*	The system successfully corrected a selected archive classification in the *Daftar Klasifikasi Arsip*
	9	1. The system first asks to select an archive classification to be deleted 2. Click ***Hapus Klasifikasi*** button and the system will display a dialog box for confirmation about the deletion process whether OK or Cancel 3. Click OK button to delete the selected archive classification or click Cancel button to terminate the deletion 4. Changes to the archive classification are saved in the *Daftar Klasifikasi Arsip* if the OK button is clicked, or the *Daftar Klasifikasi Arsip*	1. The system deletes a selected archive classification that is listed in the *Daftar Klasifikasi Arsip* if OK button in the confirmation dialog box is clicked 2. The system cancels a selected archive classification that is listed in the *Daftar Klasifikasi Arsip* if Cancel button in the confirmation dialog box is clicked	1. The system successfully deleted a selected archive classification that was listed in the *Daftar Klasifikasi Arsip* after OK button in the confirmation dialog box is clicked 2. The system successfully canceled a selected archive classification that was listed in the *Daftar Klasifikasi Arsip* after Cancel button in the confirmation dialog box was clicked

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Inter-face	Test Case	Test Phase	Expected Results	Test Results
		remains unchanged if the deletion process is canceled		
	10	Click **Kembali ke Buat Dokumen** button	The system closes the *Mengelola Daftar Klasifikasi Arsip* interface and displays the *Membuat Dokumen Baru* interface again	The system successfully closed the *Mengelola Daftar Klasifikasi Arsip* interface and displayed the *Membuat Dokumen Baru* interface again
4	11	1. Click on the Filter text box 2. Enter keywords to filter the document templates listed on the *Daftar Dokumen Template* 3. Only template documents that meet the keyword criteria will be displayed in the *Daftar Dokumen Template*	The system displays the filtered template documents which meet the keywords criteria in the *Daftar Dokumen Template*	The system successfully displayed the filtered template documents which meet the keywords criteria in the *Daftar Dokumen Template*
	12	1. Filter the Template Document List first or directly select one of the template documents in the *Daftar Dokumen Template* 2. Click ***Pilih Template*** button 3. The selected document template will be opened as a new Microsoft Word document	The system opens a selected document template as a new Microsoft Word document	The system successfully opened the selected document template as a new Microsoft Word document
	13	Click ***Kembali ke Sebelumnya*** button	The system closes the *Memilih Dokumen Template* interface and displays the Membuat Dokumen Baru	The system successfully closed the *Memilih Dokumen Template* interface and displayed the Membuat Dokumen

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Inter-face	Test Case	Test Phase	Expected Results	Test Results
			interface again	Baru interface again
5	14	1. Select one of the archive classifications where a document archive will be searched and used 2. Click ***Cari Dokumen*** button 3. A dialog box for selecting an archive to be used will be displayed 4. Select one of the document archives 5. Click OK button 6. A selected document archive will be opened as a new Microsoft Word document	The system opens a dialog box to select a file in the directory folder according to the selected archive classification and the selected file will be open as a new Microsoft Word document	The system successfully opened a dialog box to select a file in the directory folder according to the selected archive classification and the selected file was opened as a new Microsoft Word document
	15	Click ***Kembali ke Sebelumnya*** button	The system closes the *Memilih Klasifikasi Arsip* interface and displays the *Membuat Dokumen Baru* interface again	The system successfully closed the *Memilih Klasifikasi Arsip* interface and displayed the *Membuat Dokumen Baru* interface again
6	16	1. First, complete the requested Document Metadata for the document to be saved 2. Click ***Simpan ke Template*** button 3. The new document will be saved to the template folder and named with the prefix "Template" followed by the file name that is input in the metadata	The system saves a new Microsoft Word documents as template in the document template directory folder and is named with the prefix "Template" followed by the file name that is input in the metadata, along with any additional metadata that have been entered	The system successfully saved a new Microsoft Word documents as template in the document template directory folder and was named with the prefix "Template" followed by the file name that was input in the metadata, along with any additional metadata that have been entered

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Inter-face	Test Case	Test Phase	Expected Results	Test Results
	17	1. First, complete the requested Document Metadata for the document to be saved. 2. Click ***Simpan ke Folder*** button 3. A new document will be saved to the primary, secondary, and tertiary folders according to the selected archive classification and named to comply with ANRI Regulation Number 6 of 2021 with the format: Classification Code + Date + Time + File Name as entered in the Document Metadata.	The system saves a new Microsoft Word document to primary, secondary, and tertiary directory folders according to the classification code with the name entered in the document metadata, along with other additional metadata that has been input. File naming follows the format: Classification Code + Date + Time + File Name. If directory folders do not exist, the system will create them automatically.	The system successfully saved a new Microsoft Word document to primary, secondary, and tertiary directory folders according to the classification code with the name entered in the document metadata, along with other additional metadata that had already been input and named the file using a format: Classification Code + Date + Time + File Name. When directory folders did not exist, the system successfully created the folders automatically.

Functional black box testing of 6 interfaces of the VBA-based File Management Application with 17 test cases showed that the overall test results were successful as expected. This success was due to careful action research and thorough analysis. The test cases were carried out with the involvement of the person-in-charge of MSMEs in the LinkSos community.

CONCLUSION

The VBA-based File Management Application was designed to address issues found during preliminary research on the research object. The effectiveness of the application was then tested functionally using black box testing. This testing is the final stage to determine whether it runs properly or not. This ensures that the application can be implemented safely without any fatal disruptions to the system. The test results show

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that all functions on the interface run as expected. Here are some of the advantages of VBA-based file management applications:

1. The VBA-based file management application can be used to create archives by storing digital files on a desktop computer, cloud storage, or both.
2. The VBA-based file management create digital files (born-digital) that are automatically stored in folders based on Main Issues, Sub-Issues, and Sub-sub-Issues to comply with the Indonesian National Archives (ANRI) archive classification standards.
3. The VBA-based file management application can be used to automatically name files during the storage process using file naming conventions to comply with ANRI standards.
4. The VBA-based file management application can be used to add more complete file metadata during the storage process to facilitate and speed up searches.
5. The VBA-based file management application can prevent file duplication and changes to the authenticity of old files (old files will be automatically protected/read only during storage).
6. The VBA-based file management application can prevent accidental file deletion or lost (especially related to overwriting old files).

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