DIGITAL LIBRARY: A WEB-BASED SYSTEM IN HANDLING RESEARCH OUTPUTS

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An Action Research
Presented to the Schools Division Research Committee of
Tagum City Division

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CHAPTER 1

INTRODUCTION

Rationale

The COVID-19 pandemic has prompted the government, private sector, and development organizations to create web-based resources and platforms to assist local businesses in surviving and thriving (Philippine Disaster Resilience Foundation, 2020). Despite the fact that computers have become a way of life in today's modern world, it is clear that the majority of the country's institutions have yet to adopt high technology. In an increasingly competitive world, having up-to-date, thorough, and accurate information has become a must. It is critical that Information Technology functions properly and dependably in the workplace.

We now live in the "digital age," where storing information and records is no longer a difficult task. Due to social distancing practices and nationwide lockdowns, the Covid-19 pandemic has inevitably resulted in an increase in the use of digital technology (De' et al., 2020). People and organizations throughout the world have had to adapt to new jobs and lifestyles. To prevent being infected with the virus, people restrict their acceptance of things from others. Before they could touch it, certain offices had to spend money sanitizing it. Seminars, training, and workshops were held virtually to prevent physical interaction and to accommodate a larger number of attendees. Having a physical copy of previously accepted study papers is beneficial, but when there are a lot of them, it becomes a burden for the assigned keeper and takes up room, and it has no permanent storage place that could be used for books for the students.

While we are improving our service to better assist our teachers, school personnel, and students during the Covid-19 Pandemic, we still lack a system to

digitally provide a copy of a teacher-researcher’s research paper and to keep track of the statuses of the research outputs, which is a problem that requires a comprehensive solution. A file management system is a file system for organizing and tracking files. Users do not need to go through network folders; instead, they are offered fast results and a system that allows them to access data from anywhere on the Internet at any time. The ability to save them digitally solves the issue of archiving these research papers. In order for them to be guided on research topics that they want to conduct as well as to see which research topics have already been conducted in the DepEd Tagum City Division.

The file management system will assist in resolving the problem. To begin, it makes reviewing and approving content easier. The file management system will digitally store previously accepted, conducted, and used research papers, saving the School's Division Research Committee the time and effort of reviewing each physical copy. Second, since research papers are now digitally stored in the system, it will save space since it has no permanent storage place in the Division Office. The file management system can centralize all of an organization's documents for easy access. It can minimize project delays. Lastly, it will serve as a resource for teachers-researchers who are about to write a research paper. This can also be used as a guide for them to get an idea of what they can do while writing their own research paper.

As a result, with the advent of technology, it is critical to have quick access to and management of information. The proposed system's major goal is to provide an operational tool that will help teacher-researchers of the Department of Education, Tagum City Division in filing, saving, and retrieving research outputs. The researcher has curated the system just for that function to serve the teacher-researchers as well as

the School's Division Research Committee and the Department of Education, Tagum City Division.

Review of Related Literature

This chapter includes a survey of relevant literature and major studies that will allow researchers to obtain basic information and references on various views on concepts and theories in the design and development of a Web-based File Management System for the Tagum City Division of the Department of Education. It also includes several study-related operational technical phrases.

Related Literature

A file management software is an application technique for storing data on a storage device. This technique eliminates the need for people to use traditional paper-based data management systems (Roomi, 2021). These file systems are often intended to manage a variety of files with varying levels of efficiency. More and more enterprises are turning to FMS techniques to address their record-keeping difficulties. Each file in FMS is categorized and sorted according to its kind and category. As such users may quickly find the information they are looking for. It may show report information such as the owner, creation date, completion status, and other elements that are relevant in an office setting.

Downloading, moving, labeling, going to, searching for, sharing, and deleting digital files and folders are all things that computer users do daily. Many studies in numerous domains have focused on file management, but it has not been formally acknowledged or the subject of a devoted review. File management, according to Dinneen and Julien (2020), is a pervasive, hard, and largely unsupported activity that attracts and receives attention from a variety of disciplines and is relevant to a wide

range of subjects in information science. As a result, a good file management system enhances the overall efficiency of a company's operations. It also organizes crucial information and provides a searchable database for rapid access.

Advantages

The following are the advantages of the File Management Systems:

Cost Effective. The costs of managing and transferring documents back and forth are considerably minimized since there is no physical paperwork (Wood, 2021). This also enables for the filing of documents that must be stored as paper in smaller, less expensive locations. Building rents, cabinet purchases, and physical paperwork are all free of charge. Since it is a digital filing system, the file management system is relatively cost effective.

Reliability. Overhandling, fire damage, flood damage, and other natural disasters can all destroy hard copies of paper documents and files. All the user's information is kept on the servers. As data can be stored on servers all over the world, according to Wood (2021), using the File Management System to archive our papers properly without worrying about potential property loss is advantageous.

Security. Admins can define file limitations, permissions, and responsibilities using a file management system. This involves giving roles to certain individuals and allowing different levels of access to files. According to Roomi (2021), this improves efficiency because the correct file is delivered to the correct user. Modern file management software improves an office's security. It allows secure connections and provides encryption for logins.

Data Sharing, Retrieval, and Backup. FMS enables very effective data sharing with every individual, where files containing the same data can be shared with several

users at the same time (Roomi, 2021). It uses a digital method to enable quick access to essential data. Users are not required to manually search copies of documents in this system, in which the time spent retrieving data is significantly reduced. In the event of a failure, the file management system provides a seamless method of data backup.

Disadvantages

Despite the advantages of a file management system, it nevertheless has problems.

Data Redundancy. Redundancy is a type of duplication that arises when the same sort of information exists in many places (Roomi, 2021). Because flat-file databases rely on files that hold entries as text without any structure data, they cannot connect data from one file to another. There is a chance that memory will be wasted in this case, resulting in greater storage expenses.

Accessibility. Data access in a file management system is a difficult process. It is not as practical as it should be. Many users at different workstations cannot access the same data at the same time, limiting access to critical information if multiple users search for the same data at the same time (Jackson, 2021).

Data Isolation. If the data is kept in multiple locations, it could imply that it is isolated in the file management system. Under these conditions, the formats of each file can differ significantly. Therefore, retrieving data from files can be challenging because it necessitates extensive programming.

Related Studies

Foreign Studies

The study of Juan (2021) concentrates on three aspects of computer technology: information resource management, technology management, and service management.

It also focuses on information resource integration and usage, technology management promotion strategies, and novel service management system approaches. According to their observations, the main trend of the reform of file management in practice is based on computer technology. Informatics has become an unavoidable workplace trend and the principal means through which modern business society can boost work productivity.

Kitamura and Tani (2020) suggested two methods that do not require the usage of a file server (a synchronous editing method that provides a file-sharing system and an original server method that offers a virtual server startup method). It is proposed to implement a peer-to-peer (P2P) approach server administration system that does not require a separate administration server. Each management server employs a file server to exchange the management files needed to control their target servers, and virtual server system data is used to recover server functionality after failures in the P2P technique. Customers will benefit from higher-quality services as a result of our proposed method's increased server system availability.

Gori et al. (2020) interviewed 23 scientists and discovered that they all struggled to keep track of, re-find, and maintain consistency among related but dispersed information utilizing the file system. FileWeaver is a system that automatically recognizes file dependencies without the need for user intervention. Recipes can be triggered by changes to a file to keep it compatible with its dependencies. FileWeaver helps the automation of workflows by scientists and other users who rely on the file system to manage their data by making dependencies plain and apparent.

SONG (2017) created the Teacher File Management System (TFMS) to accommodate the comprehensive management of college teachers' performance

evaluations and teaching state data. The system addresses the issues of wasting time and energy while collecting and searching for university teachers, as well as a high error rate. It focuses on the key questions of RBAC-based user access control, database data with Excel file data interaction, and Fine UI control-based user interface development, among other things. The application illustrates that TFMS is user-friendly, easy to use, saves a lot of personnel and material resources, improves productivity, and has a lot of promotion and application value.

In terms of storing and retrieving files, the traditional file system no longer meets the expectations of current users. Albadri et al (2017) developed a new paradigm called VennTags to tackle the FS difficulties. The researchers do this by overlapping the sets, as in a Venn diagram. They compare the expressive capability of VennTags model to alternative alternatives, demonstrating its capacity to resolve FS restrictions.

Local Studies

Gamido et al. (2019) describe an image file management system that serves as a platform for securely distributing and viewing images. To provide further security to the file owner, the shared picture files are kept on the server in an encrypted format. The image files were encrypted using a modified AES technique with bit permutation. Image files were successfully encrypted in the server based on the trial results, and can only be decrypted by the intended recipient of the file, providing an efficient and reliable method of transmitting photos.

Android based file management system is a study about file management for SPAMAST-Digos Campus. System was developed for merging file management and communication using android devices. System has a notification feature which is very useful for sending Information messages. Includes Local Area Network for users that

are not connected to the internet. Application can also be used as an information system with complete details of the files (Albacite et al, 2018).

A study was conducted by Jayoma et al (2020) which aims to digitize The Caraga Department of Social Worker and Development (DSWD)'s records management system, ensuring the preservation of permanent and important records, which are secured and available for future reference as needed by the organization's various offices based on existing rules and regulations. The open-source Python-Tesseract (PyTesseract) library, which is a wrapper for Google's Tesseract-OCR Engine, is used in this paper to automate records classification. The procedure begins with scanning paper-based documents into digital format, followed by text recognition and extraction using the PyTesseract library. The control of records' classifications can be simplified by integrating this library with Django and MySQL.

The Archives and records management information system (ARMIS), developed by the iGovPhil Program (2017), is a government-wide document management, tracking, archiving, and disposal system. The system provides agencies with their own agency site where authorized users can search and retrieve their agencies' documents and information using the system's powerful search functions. It is a comprehensive document and record management system that strives to give government agencies with adaptable workflows to meet their unique requirements. Both the NAP and DICT verify that the system follows the policies and standards in place. Furthermore, the technology offers public access to records marked as open access through the public access portal, resulting in more efficient and effective government openness.

Synthesis

The literature and studies obtained and presented in this chapter provided the researcher with insights, facts, and enough information that will serve as the basis, guidance, and reference for the design and construction of a Research File Management System for the Tagum City Division of the Department of Education. The related studies on development, web-based file management system, android-based file management system, and records management system present details and proof that help the researcher build and construct an outstanding organizational tool. The review of literature was utilized to provide new resources to aid the researchers in the establishment of the Tagum City Division of the Department of Education's Research File Management System.

Methodological Framework

Social distancing practices and nationwide lockdowns have resulted in an increase in the use of digital technology (De' et al., 2020). People tend to limit their acceptance of things from others to avoid being infected with the virus. We now live in the "digital age," where storing information and records is no longer a difficult task. The file management system will help teachers-researchers who are about to write a research paper. It will save the time and effort of reviewing each physical copy.

The file management system will cover the document and report handling regarding conducted, submitted, disseminated, and utilized research. It would guide the teacher-researchers and the School's Division Research Committee on which research topics to pursue by identifying which research subjects have already been conducted in the DepEd Tagum City Division. It would also help us in conducting a literature review by viewing the archived files of the research outputs.

For security reasons, it can only be accessed through a local network, and only an Administrator can register the accounts of the Schools Division Research Committee members. Since it strays from the research's main goal, the file management system will not contain any feedback or discussions. Due to the same above purpose, it will also limit account management to password changes, with the aim of focusing solely on managing users' files.

Figure 1 illustrates the step-by-step sequence on the process of doing the file management system.

Initial Modeling. The researcher will create a file management system draft or blueprint. The model illustrates a project's goals. After constructing an object model, the researcher evaluates the features. These elements are meant to help the researcher navigate the numerous stages and serve as important components of the project.

Model Storming. Using the information gathered during the first design step, the researcher manages the features and how they will be implemented, as well as determining the domain classes. The researcher then examines each function and devises a solution. The researcher will begin work on the next function after completing the creation, testing, and inspection of the code.

Database Implementation. The researcher will identify and organize the information needed for the users' file management system. The researcher will then develop the database, which will include the specification of proper storage Schemas, security enforcement, and external Schemas, among other things. The choice of available DBMSs, database tools, and operating environment have a significant impact on implementation.

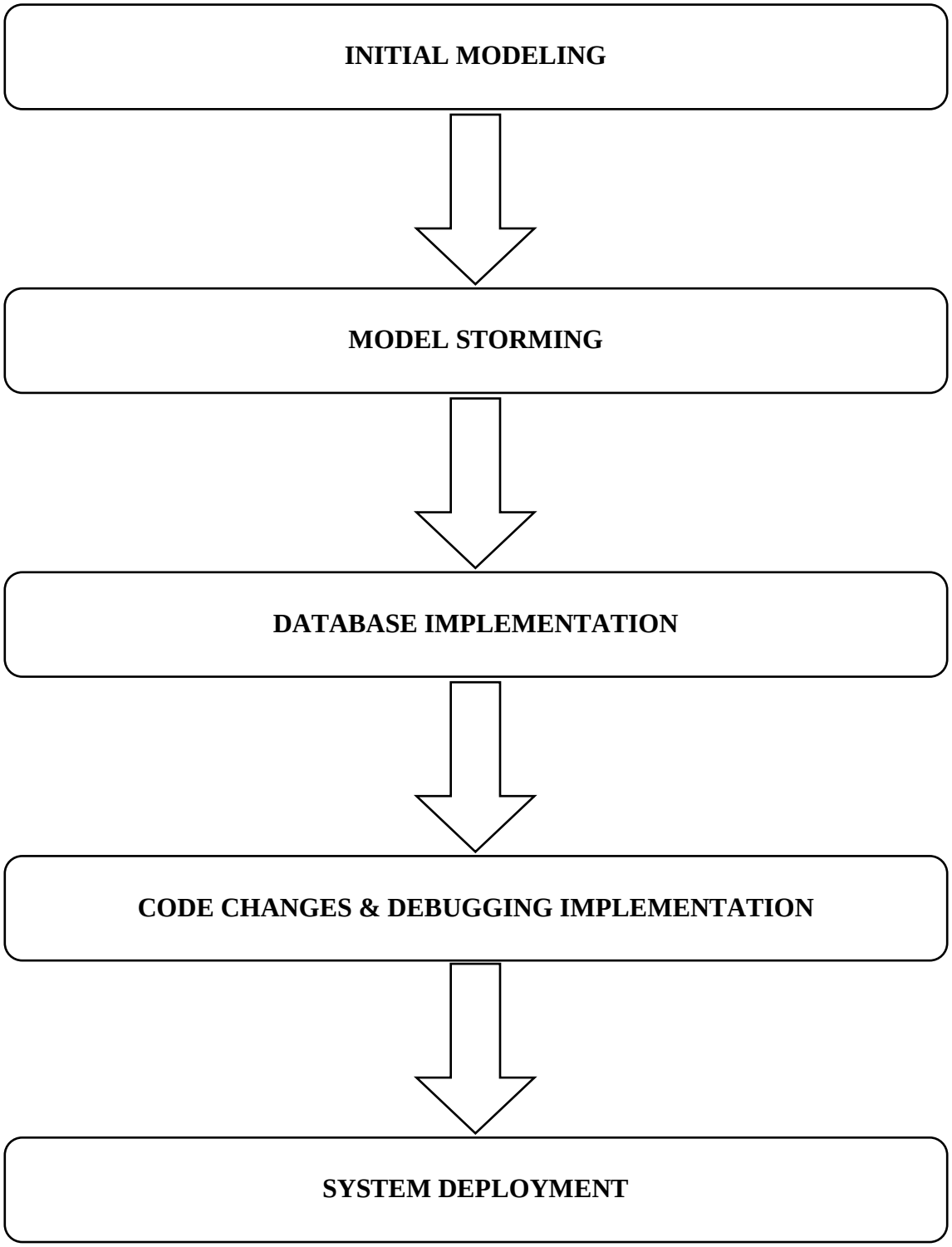

Figure 1. File Management System Process

Code Changes & Debugging Implementation. The researcher actively monitors everything that's happening as the system runs. When there are some errors and incorrect results, the researcher will locate the existing bug in the code after it manifested as error and enhance the code. It takes a lot of time since the system must undergo several System Testing to determine the code errors in the system.

System Deployment. The researcher will release the file management system and install it to the given Desktop Computer when it meets the requirements and produces no problems or inaccurate results while running.

Research Objectives

The main objective of this research is to develop a web-based file management system for the Tagum City Division of the Department of Education, which will replace the manual management of the institution's files and records with a system that is dependable, efficient, and safe.

The file management system is designed to achieve the following objectives:

1. to easily track the status of the research outputs;
2. to digitally store research outputs in one location; and
3. to minimize time and effort of reproducing the research paper.

Significance of the Study

The file management system offers several advantages to the following:

Researchers. This study will aid researchers in coming up with a topic for a research paper. Researchers can access past research papers conducted by previous Department of Education Tagum City Division research for future reference on their research paper due to the archival of past research papers conducted by previous research.

Schools Division Research Committee members. The file management system will help the Committee members in accessing the records of previous research studies and will be able to identify existing research topics. This will also assist them in keeping track of the approved, disseminated, and used research papers.

Department of Education. This study would help the department by allowing them to improve and formulate an intervention on the file management system.

Future researchers. It will serve as a reference for those with a similar interest in research and provide more tools to help them finish their projects.

Scope and Delimitation

The file management system will cover the document and report handling regarding conducted, submitted, disseminated, and utilized research. It can only be accessed through a local network and the accounts of the Schools Division Research Committee members can only be registered by an Administrator for security purposes.

The file management system will not include comments and discussions of any sort as it strays away from the main purpose of the research. It will also minimize its account management to password changing due to the same aforementioned reason, as well as its aim to focus only on managing the files of the users.

Only the School's Division Research Committee members can upload and can edit the status of the Research Outputs of the teacher-researchers. Everyone, even the guest users can search and view the Research Outputs uploaded by the user without signing in into the system as long as they are connected to the Local Area Network (LAN) where the File Management System installed.

Definition of Terms

To achieve a common understanding, the following concepts are described conceptually and operationally.

Research File Management System – This refers to the efficient management of research files and the facilitation of file and document tracing. It has the following features:

- Search feature for faster fetching of the data the user is asking.
- PDF viewer for every research file.
- Status Tracker of the Research Output, such as whether they have been conducted, submitted, disseminated, or used.
- Sort out the Research Output according to year they are approved and research type, such as Quantitative Research, Qualitative Research, Action Research, Experimental Research, or Developmental Capstone.
- Update the list of Research Outputs whenever there are new Research Outputs approved and uploaded by the Schools Division Research Committee Member.

CHAPTER 2

METHODOLOGY

Research Design

This study will utilize the design and development research to develop a web-based file management system for the Tagum City Division of the Department of Education, which will replace the manual management of the institution's files and records with a system that is dependable, efficient, and safe. According to Richey and Klein (2014), Design and development research is the systematic investigation of design, development, and evaluation processes with the goal of establishing an empirical foundation for the development of instructional and non-instructional products and technologies, as well as new or improved models that govern their development. It focused on the idea that design and development practice is empirical in nature (Richey & Klein, 2014). It highlights the similarities between the instructional design process and scientific problem-solving procedures. It is a sort of inquiry peculiar to the instructional design and technology fields that focuses on the generation of new knowledge and the confirmation of existing practice (Richey & Klein, 2014).

Implementing new features, analyzing requirements, and addressing defects are all part of the software development process (Baltes & Diehl, 2018). Being an expert in certain duties necessitates a specific set of abilities, knowledge, and experience. Several research have looked into certain areas of software development skill, but a comprehensive theory is still lacking.

The research design determines which methodologies are utilized and how they are employed. Developmental research designs are strategies utilized in lifespan

development research. Because we are interested in what changes when we try to characterize development and change, research designs become very relevant.

Table 1.

Hardware and Software Requirement

Category	Parameter	Requirement
Hardware	**Machine**	x86-64 (64-bit)
	CPU	Intel Core i7-7700HQ CPU @2.80GHz
	Memory	16 GB RAM
	Total Disk Space	256 GB
OS	**Operating System**	Windows 10
	Service Pack Level	Up to Date
Software	**Database Server**	Server: 127.0.0.1 via TCP/IP
	Web Server	PHP Version 7.0.9
	phpMyAdmin	Version information: 4.5.1
	MVC PHP Framework	Laravel Version 5.4
	Web Development	HTML5, CSS3, JavaScript, JQuery, Ajax, Bootstrap, JSON
	Programming Language	Python 3.6.4
	Hosting Service	GitHub, Google Docs
	Browser	Chrome Version 56.0.2924.87, Mozilla Firefox
	Text Editor	Sublime Text

The requirements are based on the laptop specifications of the researcher.

Research Materials

The system was developed using some specific hardware and software specifications. The Hardware & Software Requirements is shown in Table 1. The materials included in the study are the technologies used during the code implementation.

Research Technologies

This system used PHP for the database management implementation. Various technologies were used to implement the system's web application features. These are:

- **GitHub**. A Git repository hosting service, but it adds many of its own features and was used as a form of version control for the system.
- **Laravel.** A PHP Framework. It provides MVC pattern implementation which separates code logic from HTML.
- **CSS**. It is a highly effective language that provides easy control over layout and presentation of website pages by separating content from UX/UI design.
- **Bootstrap Framework**. It is a responsive, mobile-first, prevailing, and front-end framework, which is developed along with CSS, JavaScript, and HTML.
- **JSON**. It's a lightweight format that is used for data interchange.
- **AJAX**. Is a tool to communicate with the server, exchange data, and retrieve information without having to refresh the webpage.
- **jQuery**. It is a fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and AJAX interactions for rapid web development.

- **Google Drive.** It is a cloud-based storage solution that allows you to save files online and access them anywhere from any smartphone, tablet, or computer.
- **Google Docs.** A web-based word processor software, offered by Google in its Google Drive service, was used for the documentation made for the study.

Program Composition

Methods included were the Software Development Model, and Assumptions during the code implementation.

Software Development Model

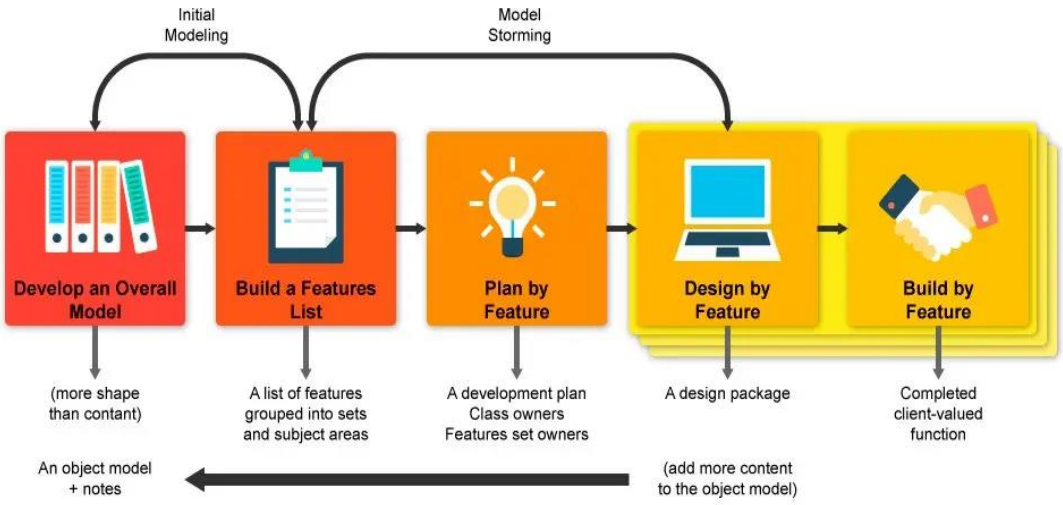

Figure 2. Feature Driven Development

Source: New Line Technologies (2018)

Feature Driven Development (FDD) was used in the development of the system. Agile Modeling (AM) was applied in FDD since the principles and practices can be

clearly applied to FDD's two modeling-oriented steps; develop an overall model and design by feature. It emphasizes quality at all steps since it is carefully designed and tested after implementation until approved. It was the ideal approach to be used since the iterations delivered were feature after feature.

Developing an Overall Model. The researcher will develop a draft or outline of the File Management System that meets the system's specifications. The model represents a project vision focused on preliminary research findings.

Building a Features List. It's time to evaluate the features after the researcher has built an object model. These features are intended to serve as the project's key components, assisting the researcher in navigating the various processes.

Planning by the Feature. The researcher manages the features and how they are to be implemented.

Designing by the Feature. The researcher selects all of the features that should be developed next and also determines the domain classes using the information obtained from the first modeling phase. After starting the task, the researcher analyzes each function and designs a solution for it.

Building by the Feature. After the researcher has completed the creation, testing, and inspection of the code, the researcher will begin work on the next function.

Assumptions

Table 2 presents the assumption of this study. During the development of the File Management System, the Researcher made the following assumptions:

Table 2.

Assumptions

	Description
1	All the users are members of the School's Division Research Committee, who has the designation in the Department of Education, Tagum City Division.
2	The user's login information (username & password) will be created by the Division IT Officer of the Department of Education, Tagum City Division.
3	All the user's input values of the research file uploading are all right in terms of spelling, format, and validated.
4	All the guest user's can be DepEd Employee or non-DepEd Employee, who are not a member of the School's Division Research Committee.

Ethical Considerations

In adherence to the standards set by the Department of Education, Tagum City Division Ethics Review Committee, the researcher took specific steps to ensure that respect, beneficence, and justice were observed. To achieve such, consent, voluntary participation, privacy and confidentiality, risk identification and mitigation, and identification of potential benefits will apply during the data gathering and writing process of the study. Other ethical issues such as plagiarism, fabrication, falsification, conflict of interest, deceit, observation permission from organization or location, and authorship will also observe during the whole course of the study.

Permission from the Research Locale

The researcher asked permission from the Schools Division Superintendent of Tagum City Division to conduct the study to develop a system for the Schools Division Research Committee. After that, researcher also sought the approval from the School Head of Tagum National Trade to conduct the study where the system will be tested.

Plagiarism

Plagiarism is the unethical practice of using another author's words or ideas. The researcher took the following procedures, such as paraphrasing, translating, direct quoting, and summarizing to prevent plagiarism while inserting details throughout the research report. The researcher also used plagiarism identification methods to scan for any inadvertent text plagiarism.

Fabrication

The study considered and established the objective criteria and requirements for consistency. The researcher took responsibility for every result to verify every detail being gathered. By standing firm on the results of the study, the researcher avoided aggrandizement, and was conscious of the possible risks.

Falsification

To ensure that the study had no trace of purposely misinterpreting the work to fit a model or theoretical expectation and no evidence of over claiming exaggerations, this study passed through the research administration of the Department of Education, Tagum City Division Ethics and Review Committee for verification, audit and controlling thorough internal regulation guarantee that this study delivered a high integrity result.

Authorship

The researcher, who is the author of this thesis, is the name which appears in the manuscript's title page. She should be the sole author of this work as she made significant contributions to planning and developing, or collecting data, or evaluating and understanding data, writing the report, or objectively revising it for appropriate analytical material, and was responsible for the final acceptance version to be

published. Moreover, she made a significant, and new contribution to the research and agreed to take responsibility for at least some of the content of the manuscript, including a review of the relevant raw data, read, and agreed to the paper before publication. She decided to be named as an author. Agreement to be accountable for all aspects of the work to ensure that issues pertaining to the accuracy or integrity of any part of the work are properly investigated and resolved. The author of this research manuscript contributed to the scientific content both mentally and spiritually, molding the research aspect in a presentable and understandable form.

REFERENCES

Albacite, G., Macua, D. R., Diolata, A. J., & Sobejana, N. (2018). Android-based File Management System. Available at SSRN 3780535.

Albadri, N., Dekeyser, S., & Watson, R. (2017). VennTags: A file management system based on overlapping sets of tags. iConference 2017 Proceedings Vol. 2.

Archives and records management information system (ARMIS). (2017, September 4). iGovPhil Program. https://i.gov.ph/archives-records-management-information-system-armis/

Baltes, S., & Diehl, S. (2018, October). Towards a theory of software development expertise. In Proceedings of the 2018 26th acm joint meeting on european software engineering conference and symposium on the foundations of software engineering (pp. 187-200).

De', R., Pandey, N., & Pal, A. (2020). Impact of digital surge during COVID-19 pandemic: A viewpoint on research and practice. International Journal of Information Management, 55, 102171. https://doi.org/10.1016/j.ijinfomgt.2020.102171

Dhir, S., Kumar, D., & Singh, V. B. (2019). Success and failure factors that impact on project implementation using agile software development methodology. In Software engineering (pp. 647-654). Springer, Singapore.

Dinneen, J. D., & Julien, C. A. (2020). The ubiquitous digital file: A review of file management research. Journal of the Association for Information Science and Technology, 71(1), E1-E32.

Feature driven development methodology – Custom web & mobile development company – New line technologies. (2018, February 28). Custom Web & Mobile Development Company - New Line Technologies. https://newline.tech/feature-driven-development-methodology/

Gamido, H. V., Gamido, M. V., & Sison, A. M. (2019). Developing a secured image file management system using modified AES. Bulletin of Electrical Engineering and Informatics, 8(4), 1461-1467.

Gori, J., Han, H. L., & Beaudouin-Lafon, M. (2020, October). FileWeaver: Flexible File Management with Automatic Dependency Tracking. In Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology (pp. 22-34).

Juan, D. (2021, March). Research on Personnel File Management Based on Computer Information Technology. In Journal of Physics: Conference Series (Vol. 1827, No. 1, p. 012187). IOP Publishing.

Jayoma, J. M., Moyon, E. S., & Morales, E. M. O. (2020, December). OCR Based Document Archiving and Indexing Using PyTesseract: A Record Management System for DSWD Caraga, Philippines. In 2020 IEEE 12th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM) (pp. 1-6). IEEE.

Kitamura, M., & Tani, K. (2020). Development of File Management System for a Peer-to-Peer Method Server Management System. Journal of Information Systms Society of Japan, 16(1), 1-16.

Philippine Disaster Resilience Foundation, 2020. Digital transformation key to recovery of education and business sectors amid pandemic. [online] Available at: <https://reliefweb.int/report/philippines/digital-transformation-key-recovery-education-and-business-sectors-amid-pandemic> [Accessed 10 May 2021].

Richey R.C., Klein J.D. (2014) Design and Development Research. In: Spector J., Merrill M., Elen J., Bishop M. (eds) Handbook of Research on Educational Communications and Technology. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-3185-5_12

Roomi, M., 2021. 7 Advantages and Disadvantages of File Management System | Limitations & Benefits of File Management System. [online] HitechWhizz - The Ultimate Tech Experience. Available at: <https://www.hitechwhizz.com/2021/02/7-advantages-and-disadvantages-limitations-benefits-of-file-management-system.html> [Accessed 24 May 2021].

SONG, F., & LIU, R. G. (2017). Study of Several Key Problems in Developing Teacher File Management System of Colleges and Universities. Mechanical & Electrical Engineering Technology, 10.

Wood, R., 2021. The Advantages of a File Management System. [online] Techwalla. Available at: <https://www.techwalla.com/articles/the-advantages-of-a-file-management-system> [Accessed 24 May 2021].