American Journal of Software Engineering and Applications
2024, Vol. 12, No. 1, pp. 14-22
https://doi.org/ 10.11648/j.ajsea.20241201.13

Research Article

Implementation of RDBMS in Establishing a Digital Repository for Schizophyllum Commune (Kurakding) Regional Knowledge

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Abstract

Developing a relational database management system offers benefits such as organized data storage, efficient querying, data integrity, scalability, security, and enhanced collaboration. These advantages can collectively contribute to a comprehensive and reliable resource for Kurakding (*Schizophyllum Commune)* related information, catering to the needs of farmers, researchers, educators, enthusiasts, and other stakeholders. Kurakding, as known by the locals, is an edible and medicinally important mushroom, particularly popular in the Bicol Region of the Philippines, Southeast Asia. Rapid urbanization and growing populations threaten the mushroom's natural habitat, leading to its scarcity and increased market value. Recognizing the potential benefits of Information Technology (IT) for agricultural development, a digital repository for Kurakding regional knowledge was implemented. The study employs a developmental and experimental research design, creating a DBMS from scratch and comparing its effectiveness against existing systems. The database development life cycle, which comprises five phases: requirements analysis, initial design, prototyping, data entry management, and full-pledged development, was strictly adopted during the design and development of the digital repository. Secondary data, research outputs, and interviews with stakeholders contributed to data gathering. Results include a conceptual framework and logical design for a KIS Repository, represented through Entity-Relationship Diagram (ERD). The ERD depicts entities such as User, Content, research, and statistics, facilitating user interaction, data management, and forum engagement. Database tables are designed to store user information, Kurakding statistics, research data, content, and forum interactions. Improving the database framework for integrating scientific data enhances its usefulness for diverse stakeholders in the Kurakding industry. This study emphasizes the importance of a digital repository in broadening knowledge about Kurakding and fostering stakeholder involvement. Ultimately, this study created a comprehensive and user-friendly resource for Kurakding-related information, facilitating its sustainable cultivation and utilization.

Keywords

Relational Database Management System, Digital Repository, Kurakding, Schizophyllum Commune, Database

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Received: 17 April 2024; **Accepted:** 7 May 2024; **Published:** 24 May 2024

1. Introduction

Schizophyllum commune is an edible mushroom that is also proven to be medicinally important [1]. It is a widely widespread wood-decaying basidiomycete regarded as a high-value agricultural product.

The species is edible and widely consumed in Southeast Asia. Its popularity in the Bicol Region, Philippines, particularly in the Partido Area, puts it in high demand, making it a costly commodity. *Kurakding*, as called by the locals, is a light brown fungus that adheres to and spreads on damp rotting tree limbs, particularly after a lengthy rain. It has been prepared for their meals, and its scarcity makes it a valuable commodity.

Growing populations and creeping urbanization place tremendous strain on resources such as idle land where Kurakding thrives, making it scarce. Kurakding currently fetches a premium in the market due to its "rareness." Moreover, studies have shown that the application of information communication technology has been beneficial for agricultural development. According to Vidanapathirana, Information and Communication Technology-based agriculture information support systems are vital for the dissemination of agricultural information and technical knowledge to farming communities. Demiryurek et al., pointed out that implementing an Agricultural Information System can help inform decisions regarding land, labor, livestock, capital, and management to better understand their decisions to take advantage of market opportunities and manage continuous changes in their production systems. Information systems have also been applied in crops such as mushrooms. Bramantara et al. presented a study on mushroom cultivation that uses a smart farm system. This farm system has been used by mushroom farmers to easily monitor and maintain the conditions temperature and humidity in mushroom cultivation through their website to produce superior mushrooms [2-4].

Due to Kurakding's beneficial characteristics and the potential benefits of ICT for agricultural growth, the researchers proposed the implementation of a relational database management system (RDBMS) in developing the digital repository for Kurakding Information System into a structured and user-friendly database. Specifically, the focus is given to the logical and physical database designs which are crucial for efficiently organizing, managing, and accessing data related to this species.

The development and capitalization of knowledge have been defining the features of economic development in recent decades [5]. A database houses pertinent information crucial for an organization. Its primary objective is to provide a convenient and efficient means to store and retrieve database information [6]. Over time, database management has evolved from a specialized computer application to a pivotal component of virtually all enterprises, necessitating expertise in database systems.

Organizations rely on effective Database Management Systems (DBMS) to organize and manage data daily. It has been an essential component of most successful information system [7]. The database contains relevant information aiming to provide convenient and efficient data storage and retrieval [8]. As database management becomes essential for various industries, the best DBMS enables accurate data maintenance, manipulation, and easy access for multiple users. A Relational Database Management System (RDBMS) is particularly powerful, as it deals with related tables, simplifying data manipulation. Relational databases are widely used in various fields that require the storage of large volumes of data, which provide reliable storage, organization, and access to data [9]. The progress of an industry is directly related to the effective construction and overall maintenance of full-fledged databases [10]. In the digital age, the demand for organized and accessible knowledge repositories has grown, leading to the creation of a Digital Repository for Schizophyllum commune (Kurakding) Regional Knowledge in the Philippine setting, which aims to consolidate fragmented information into a user-friendly database.

Developing an RDBMS offers benefits such as organized data storage, efficient querying, data integrity, scalability, security, and enhanced collaboration [11]. These advantages can collectively contribute to a comprehensive and reliable resource for Kurakding-related information, catering to the needs of farmers, researchers, educators, enthusiasts, and other stakeholders.

The overall goal of this research was to create a relational database management system that is correctly and logically organized to allow users to create and retrieve information about Schizophyllum commune (Kurakding). Specifically, this aimed to design the conceptual framework for Kurakding Information System (KIS) Repository and develop the appropriate database tables for the KIS repository covering all the Kurakding comprehensive resources and information.

2. Research Design and Methodology

2.1. Research Design

This study uses developmental and experimental research design. Developmental in such a way that this study created a database management system technology for Kurakding which involved designing and building the DBMS from scratch. Furthermore, the experimental research design involves systematically comparing the newly developed database management system against existing systems or benchmarks. This approach helps to assess the effectiveness, efficiency, and overall performance of the created DBMS in comparison to other alternatives.

Figure 1 presents the database development life cycle utilized by the researchers. It comes in five phases and emphasizes the iterative process of prototyping, refining, and iterating the system until it meets the desired objectives.

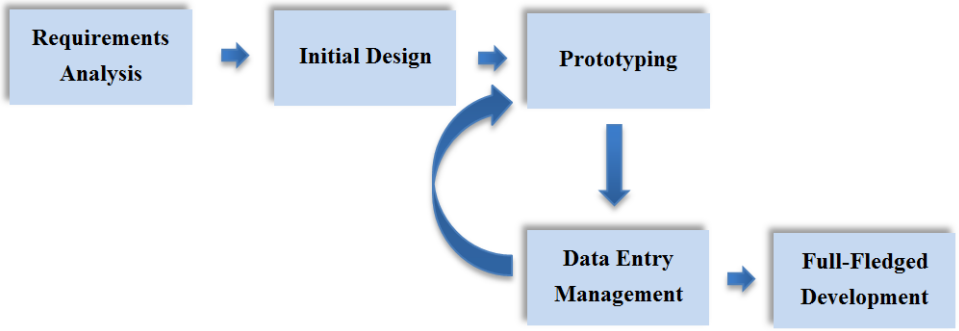

Figure 1. Database Development Life Cycle.

The first phase is the *Requirements Analysis* to collect all the data about Kurakding raging from its collecting sites, uses, benefits, applications, and products. The second phase is the *Initial Design* where the initial database schema design is created using Entity-Relationship Diagram (ERD). This design represents the entities and their relationships in Kurakding's domain. It was immediately followed by the *Prototyping* phase where the researchers developed a prototype of the DBMS using a rapid application development (RAD) approach and MySQL (an open-source relational database management system) to handle the data storage. The focus is only on quickly creating a functional version of the system. The fourth phase is *Data Entry Management*. In this phase, the prototype was used and tested by the user which enables them to enter and manage data. This phase is essential in getting feedback from the user to identify issues, missing features, and other concerns for the system. It will then iteratively refine the prototype until it meets the user requirements. Finally, the last phase is the Full-Fledged Development which involves scaling the system, addressing considerations, optimizing performance, and incorporating additional features based on the requirements.

2.2. Data Gathering

Secondary data were used to gather knowledge on Kurakding ranging from its collecting sites, uses, benefits, applications, products, biological characteristics, etc. Research data and outputs on Kurakding, as well as records, were also considered. Interviews were also conducted to validate secondary data. Data flow analysis to identify data sources, usage patterns, and potential bottlenecks. This is followed by Prototype testing which involves potential users interacting with the system to gather feedback on its usability, functionality, and performance.

2.3. Respondents

Respondents to this study include Kurakding cultivators, processors, and merchants, as well as researchers from Partido State University, mushroom researchers from other schools, regional mushroom growers/farmers, and people from the Department of Agriculture.

3. Results and Discussion

3.1. Conceptual Framework Design for KIS Repository

The importance of conceptual and logical framework design in databases lies in their role as the foundational structure for organizing, representing, and managing data [12]. The conceptual design establishes a high-level understanding of the database's purpose and relationships between various entities. This can provide just enough information to give the stakeholders or users an idea of the kind of data and operations the system will contain [6].

The logical design, on the other hand, transforms the conceptual model into a structured and efficient database schema, incorporating data normalization, indexing strategies, and query optimization. A well-crafted conceptual and logical framework ensures data accuracy, integrity, and accessibility, contributing significantly to the overall performance and usability of the database system [13].

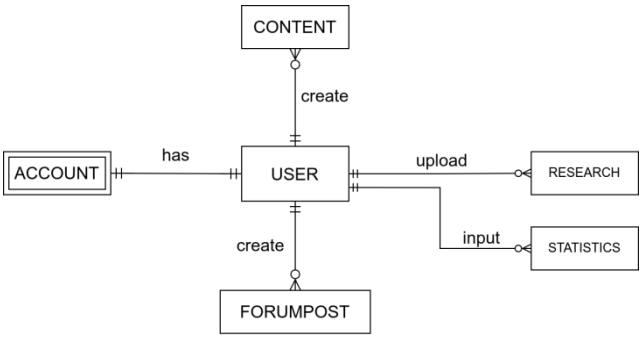

Figure 2. KIS Repository ERD (Conceptual Model).

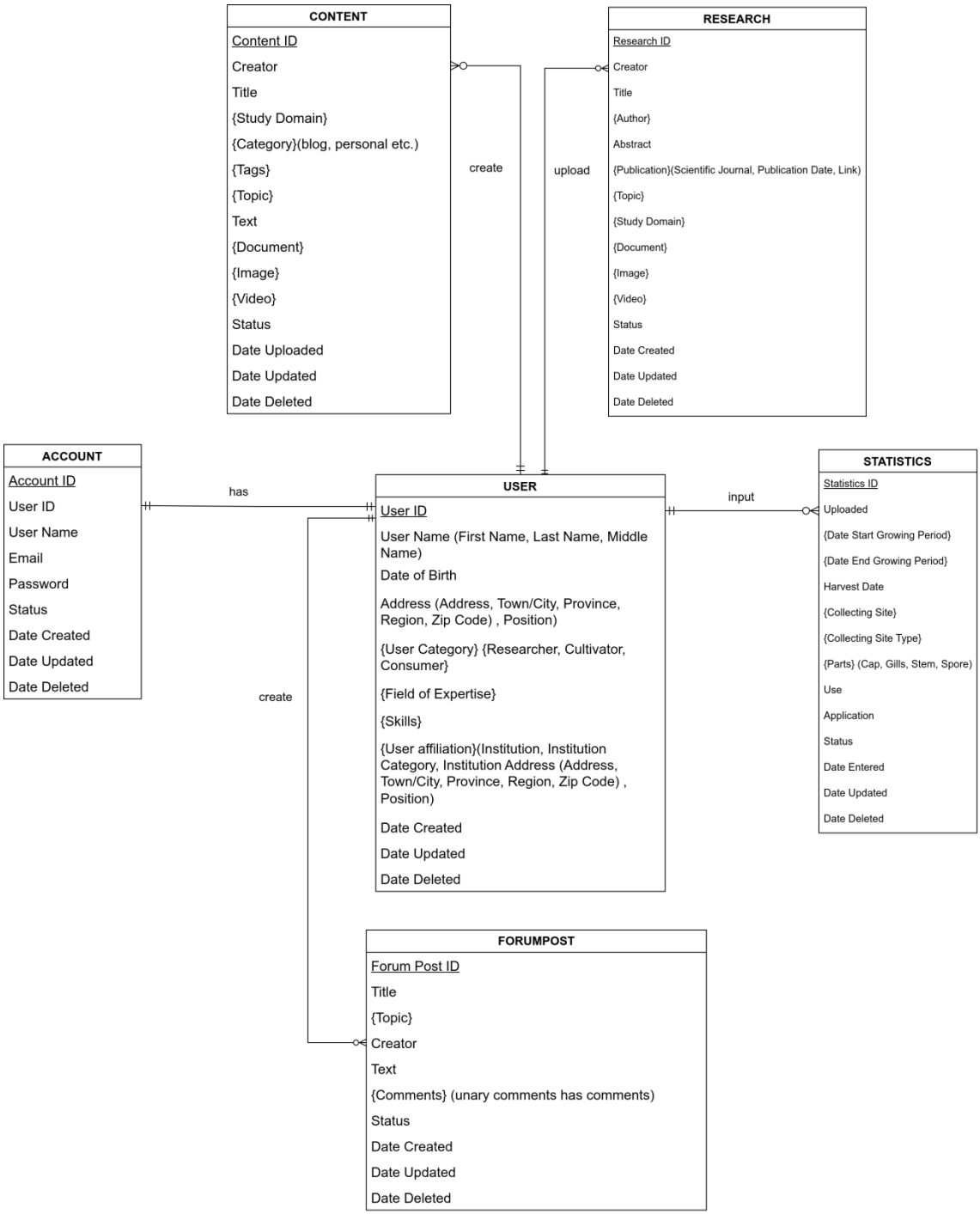

Figure 3. *KIS Repository ERD with attributes.*

ERD is a visual representation of the conceptual structure of a database. It is a powerful tool for designing databases, especially during the conceptual design phase. Figure 2 presents the ERD conceptual model for the KIS Repository.

It has six entities (Account, User, Content, Forumpost, Research, and Statistics) that reflect the real-world entity information in the physical database. There are five relationships that support the described schema:

User_Account: A one (and only one) to one (and only one) relationship

User_Content: A one (and only one) to zero or many relationship

User_Research: A one (and only one) to zero or many relationship

User_Statistics: A one (and only one) to zero or many relationship

User_Forumpost: A one (and only one) to zero or many relationship

Figure 3 presents an ERD of Figure 2 with attributes included. Attributes provide specific information about an en-

tity. It shows that a User has an Account that allows him to access the system. They can create content in the system as a blog or as a personal post. They can upload a copy or a link to their research. Statistics about Kurakding can be recorded as well such as harvest date, collecting sites, collecting site types, parts, uses, applications, status, and important dates of managing the data. They can also engage in forums.

The ERD has undergone refinement and normalization before it reaches that stage. This is to eliminate redundancies and identify areas for improvement. ERD provides a high-level view of database design and focuses on the relationships and structure of data rather than implementation details. They are an essential tool for communication between designers, stakeholders, and developers involved in the database development process.

3.2. Database Tables for the Kurakding Information System Repository

Once the conceptual design is solidified, logical design follows which involves mapping the ERD into a specific database management system's data model. This includes defining tables, columns, primary keys, foreign keys, and other database-specific components.

MySQL, an open-source relational database management system, was used to build the Kurakding Information System database. It arranges correlated data into one or more data tables, and the correlation aids in the data structure.

The data schema for this database was created through an iterative process of interaction with some of the experts in the database and Kurakding. It has been normalized to minimize data duplication, ensure consistency, and simplify updates. As shown in Figures 4 to 7, the database model is based on a range of data that is inherent in the attributes of classes of the database.

The schema shown in Figure 4 presents the type of users the Kurakding Information System has. The users of the KIS can be the Kurakding farmers, researchers, consumers, and guests. It stores the user's category (description and status), affiliation (institution, position, and status), institution (institution name, category, and status), address (details, zone, street, barangay, town or city, etc.), expertise (expertise and status), and skill (skill and status).

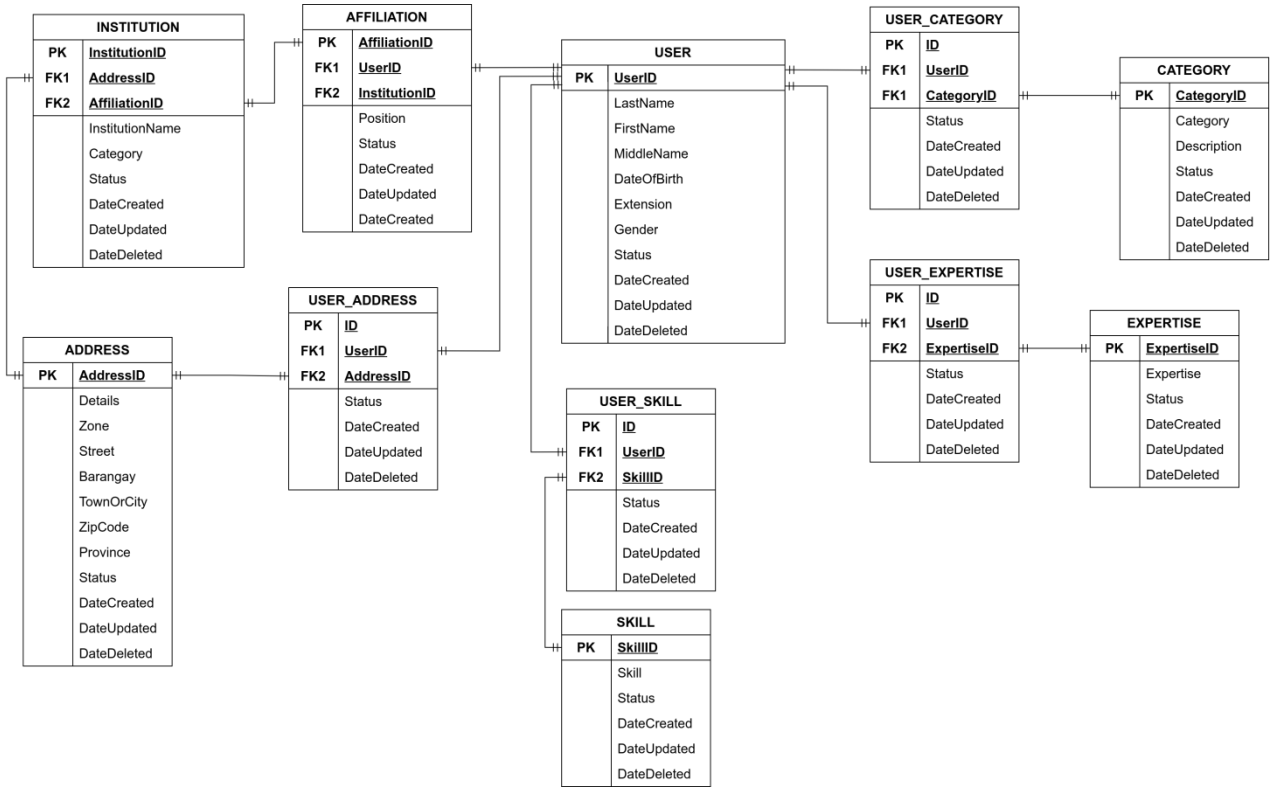

Figure 4. *Database Schema for User.*

Kurakding's statistics include biological characteristics, collecting sites, uses, benefits, applications, and products as shown in the Figure 5 schema. The statistics table holds the Kurakdings' biological characteristics as well as their growing period and harvest time. It also records the date the data was entered, updated, or deleted in the system. The collecting site and collecting site-type tables store the data where the Kurakding was harvested or cultured.

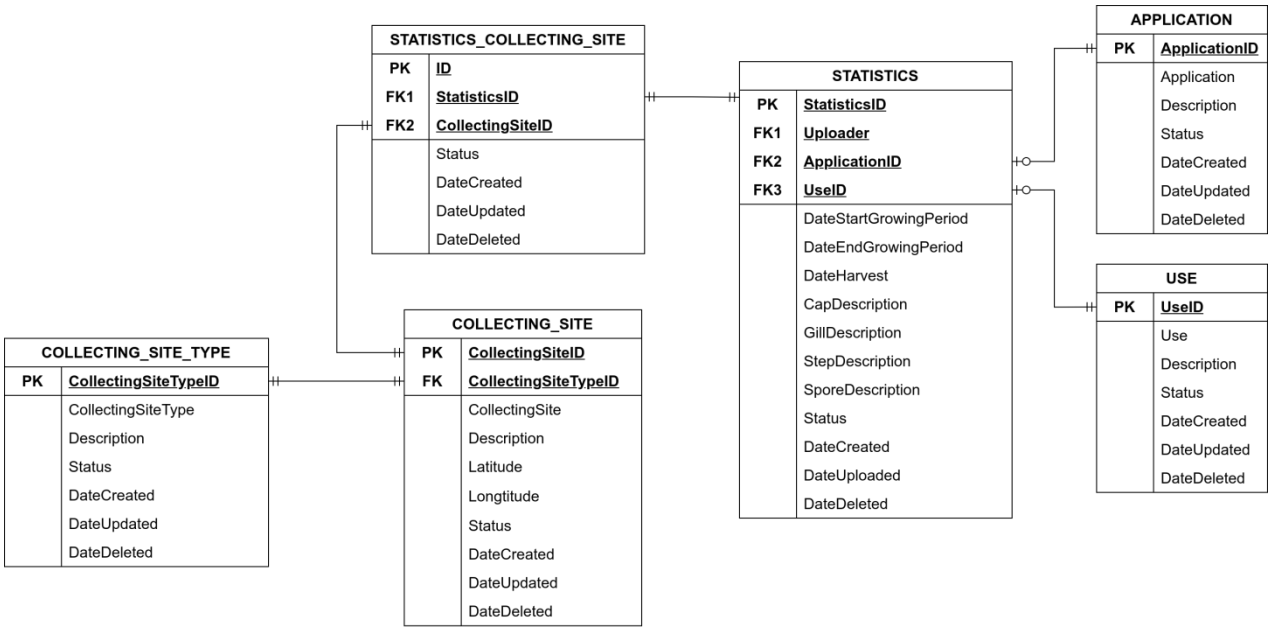

Figure 5. *Database Schema for Statistics.*

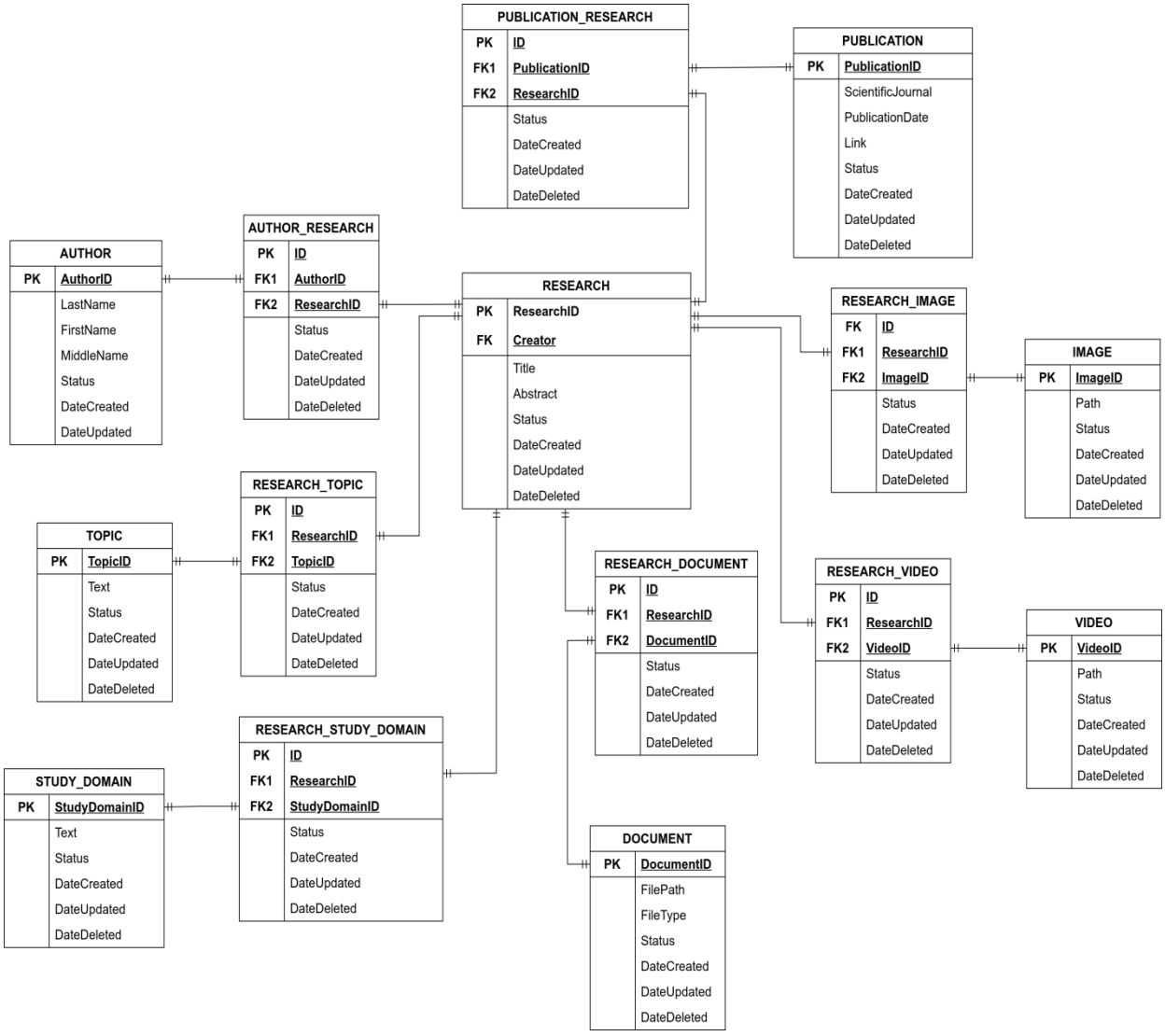

Figure 6. *Database Schema for Research.*

Researchers, as one of the users of the KIS, have the user privilege to input data about their research. This database schema in Figure 6 can store the author's name, research topic, study domain, details about their research publication, images and or videos, and documents relevant to their research.

The KIS also caters to content exclusively for Kurakding. Content can be in the form of blog posts or videos. Figure 7 presents the database schema for Content. It stores data about the creator of the content, title, topic, category, study domain, documents, images, videos, tags, and dates created, updated, and deleted.

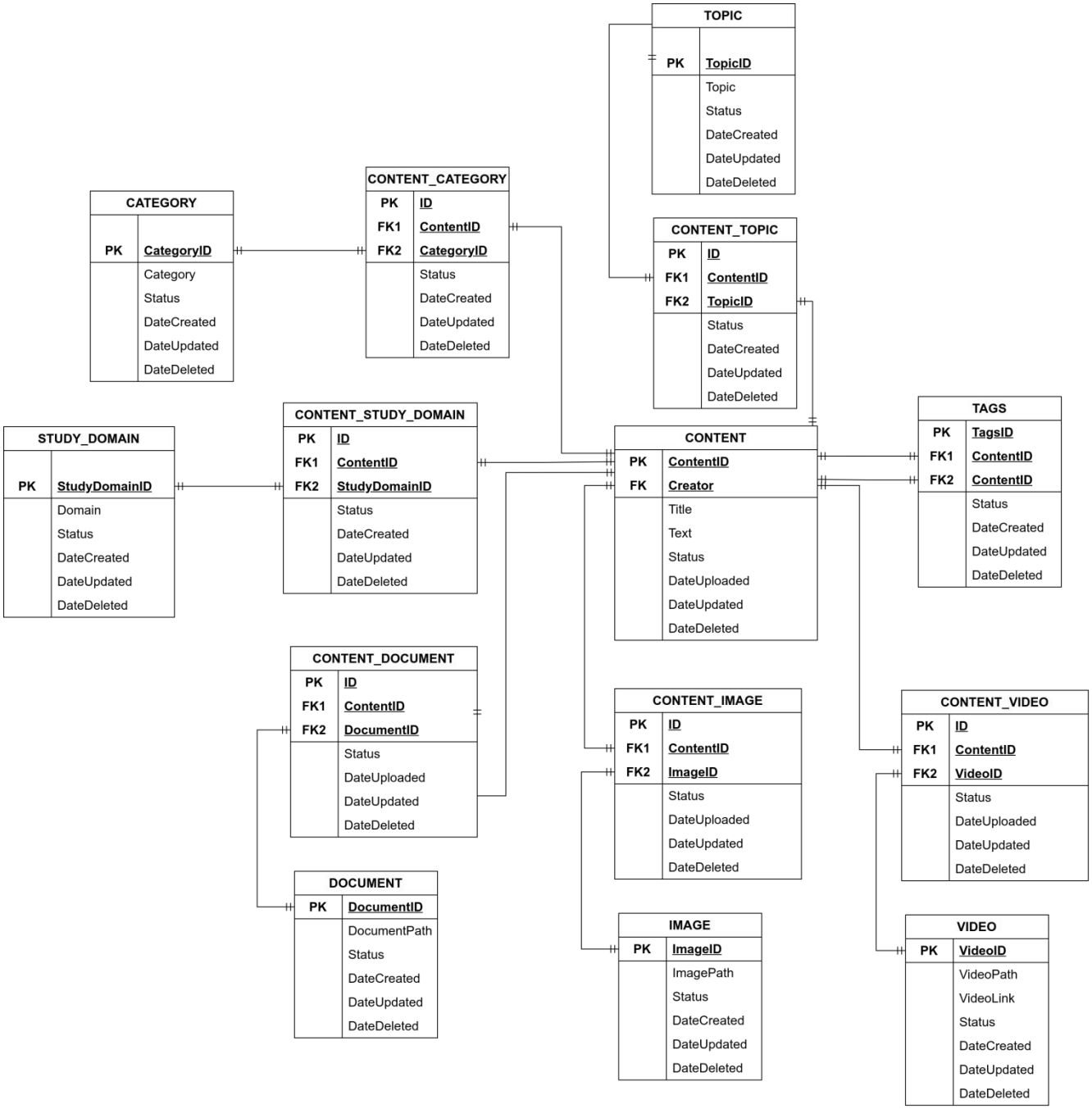

Figure 7. *Database Schema for Content.*

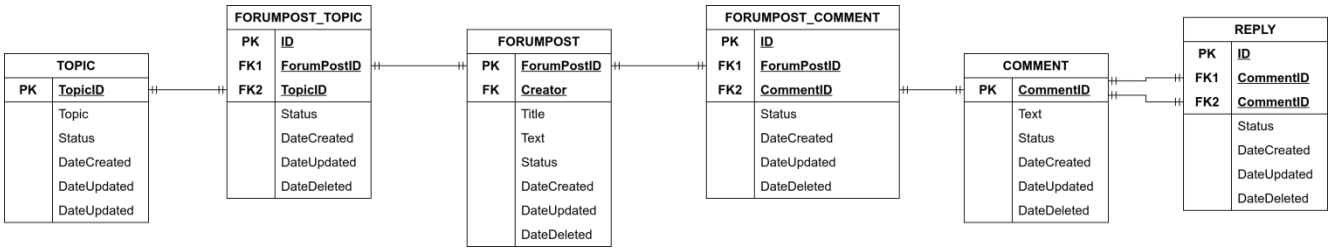

Figure 8. *Database Schema for Forum.*

Figure 8 presents the database schema for Forum. This records data about the forum topic, the creator of the forum, the date the forum was created, updated, and deleted, as well as the comments made in the forum.

4. Conclusion and Recommendation

The development of the Kurakding Information System database allows Kurakding information to easily expand its knowledge area. Following an examination of related literature, systems, and data standards, an innovative database development life cycle was created by the researchers to have a better approach to ensuring the successful creation and management of the database. Moreover, the unique data model was created to enable the smooth entry and retrieval of Kurakding information.

This KIS was built and developed to provide users and database managers with online access to the database. This also provides a straightforward submission platform for independent researchers to provide fresh Kurading studies. As a result, the database will facilitate the speedy and comprehensive examination of Kurakding's potential. Similarly, this technology may be used to promote stakeholders to ensure the Kurakding industry's long-term viability.

Concerning the study's future path, it is recommended that further work will be done to enhance the structure so that it can better contain scientific data and deliver meaningful information in the future. Once the database is filled with current information, this system may be a valuable resource for a wide range of stakeholders.

Abbreviations

DBMS	Database Management System
ERD	Entity-Relationship Diagram
ICT	Information and Communication Technology
KIS	Kurakding Information System
RAD	Rapid Application Development
RDBMS	Relational Database Management System
SQL	Standard Query Language

Author Contributions

Shane Catolico Briones: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing – review & editing

Salvador Villar Briones II: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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