



(RESEARCH ARTICLE)



## Enhancing registration systems: Implementing database systems in digital boarding schools

Haris Setyawan \*

*Information Technology, Engineering Faculty, Universitas Muhammadiyah Yogyakarta, DI Yogyakarta, Indonesia.*

World Journal of Advanced Research and Reviews, 2024, 22(02), 856–863

Publication history: Received on 30 March 2024; revised on 09 May 2024; accepted on 11 May 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.22.2.1451>

### Abstract

Islamic boarding schools, known as pondok pesantren are specialized schools for Islamic education in Indonesia. With the community's increasing interest in religious education, some pesantren have begun to offer online learning opportunities. Pondok Pesantren Bayt Tamyiz is a Islamic boarding school that has started developing online pesantren education under the name Tamyiz Digittren. This program aims to enhance understanding and translation of the Qur'an using the Tamyiz method. The pondok pesantren requires significant changes in its administrative systems, including the registration process. Information system development is often challenging for the pesantren staffs and software developers. One of the fundamental difficulties lies in the user requirement process. Typically, pesantren need help to provide the information system they need. Such difficulties hinder the development process as developers must conduct numerous experiments. This research aims to design and implement a suitable database for the new student registration system with minimal information and limited time development. The research follows a database development method divided into three stages: Requirement Collection and Analysis, Conceptual Database Design, and Logical Database Design. Database development utilizes MySQL as the Database Management System (DBMS) and PHP as the programming language. This research results in a database design capable of storing and managing student data, payments, and other registration information. We expect the results of this database development to be effective in supporting the registration system and in the future development of information systems at Pondok Pesantren Bayt Tamyiz.

**Keywords:** Database Design; DBMS; MySQL; PHP; Pondok Pesantren; Pesantren Digital

### 1. Introduction

Islamic education plays a vital role in the formation of character and the national identity of Indonesia. A diverse range of Islamic educational forms thrive in Indonesia, one of the most prominent being the pesantren (traditional Islamic boarding school), both traditional and modern [1]. A pesantren is not just an educational institution but a richly traditional establishment with unique characteristics. Beyond just providing formal education, pesantrens also offer non-formal education that includes in-depth studies of religious sciences, interpretation of the Quran, and developing various skills [2]. The strategic role of pesantren lies in maintaining and enriching Islamic values in daily community life [3].

One of the pesantrens who diligently carry out these duties is Pondok Pesantren Bayt Tamyiz. This boarding school is an Islamic educational institution that offers a deep understanding of Islamic religious sciences and Quranic interpretation. This pesantren has a clear vision to build Muslim characters who are ethical, knowledgeable, and charitable, and a mission to conduct high-quality formal and non-formal education, optimize the potential of students,

\* Corresponding author: Haris Setyawan

and provide professional services to the community. Pondok Pesantren Bayt Tamyiz is committed to achieving high and competitive educational standards.

One of the flagship programs offered by Pondok Pesantren Bayt Tamyiz is the Tamyiz learning program. This program aims to enhance students' abilities in understanding and translating the Quran using the Tamyiz method. The Tamyiz method integrates the learning of Arabic with the understanding of Quranic texts. It employs a relaxed and enjoyable approach, such as games, songs, and drumming, to help students more easily master Arabic vocabulary and grammar. Additionally, this method assists students in understanding the context and meanings of Quranic texts. By participating in the Tamyiz learning program, students are expected to become ethical, knowledgeable, and charitable Muslims, in line with the vision and mission of Pondok Pesantren Bayt Tamyiz.

The founder of Pondok Pesantren Bayt Tamyiz took the initiative to establish a digital pesantren so that the Tamyiz learning model could reach a broader audience. This program has been named "Tamyiz Digittren." This initiative requires thorough preparation, one aspect of which is setting up a registration system. Currently, the Tamyiz learning program requires direct registration at Pondok Pesantren Bayt Tamyiz office. This process is still carried out manually, involving the filling out of paper forms and payment of registration fees on-site at the pesantren. This manual approach is no longer suitable for the proposed digital model, as prospective students or students are required to allocate time and expenses to visit the pesantren campuses. Moreover, the manual approach also poses risks of errors, duplication, or data loss, which can affect the quality of service provided by the pesantren to its students. Therefore, there is a need to develop an online registration system that facilitates the registration process for the Tamyiz learning program efficiently. This online system is expected to provide convenience for students to register for the Tamyiz learning program flexibly, without being bound by time or place constraints, and without the necessity to visit the pesantren directly.

---

## 2. Material and methods

### 2.1. Theoretical basis

A database is a collection of non-redundant data shareable between different application systems. A database represents a series of interrelated facts stored together efficiently and without unnecessary repetition (redundancy), to meet various needs. A Database Management System (DBMS) allows database users to maintain, control, and access data practically and efficiently. The DBMS serves as a layer that connects the database to application programs to ensure that the database remains consistently organized and easily accessible. The primary goal of using a DBMS in a computer network is to prevent chaos in processing large amounts of data [4].

The form of a database refers to the structure or model used to store and organize data within a DBMS. This includes types such as relational, hierarchical, network, and object databases [5]. Each type has a different way of organizing and accessing data. The relational database is the most used type. A relational database is a collection of related data that is connected through primary keys between one table and another. The structure of a relational database consists of rows and columns that can combine data into one or more tables, generally referred to as relations. The existence of these relations is beneficial for users as it facilitates the analysis of data within the database [6].

The stages in building a database include planning, designing, implementing, data filling, testing, and maintenance. Each stage holds equal importance in ensuring the success of a database project. However, the planning stage is usually considered the most critical as it lays the foundation for the entire project [7]. Good planning ensures that business needs are well understood. The database structure is designed according to the goals and needs of the organization. The design of a relational database is divided into three main phases, the first of which is Conceptual Database Design. This stage involves creating a model based on information used by the company or organization, without considering physical planning [8]. Next, Logical Database Design is an abstract form of database design, where the focus is on defining entities and attributes. Although it does not detail technical aspects such as data types and character counts, this design provides a solid foundation for database development [9]. Lastly, Physical Database Design is the stage where the implementation description of the database on secondary storage is created. This process explains the basic relationships and file organization used to achieve efficient access to data.

When designing a relational database, it is necessary to identify the relevant and important entities within the domain being modelled. Once these entities have been identified, the next step is to determine the appropriate attributes for each entity. After that, the relationships among entities must be established, such as one-to-one, one-to-many, or many-to-many, and be properly implemented in the relational database structure. This step is crucial to ensure that the relational database accurately and efficiently models the real world. The Entity Relationship Diagram (ERD) is a diagram

used to represent information that is created, stored, and used within the context of a business system to describe the relationships or connections between visible entities or objects along with their attributes. Essentially, the ERD is a model that explains the relationships among data in a database based on basic data objects that have relationships with each other. The main components in the identification of the Entity Relationship Diagram (ERD) include entities (consisting of strong and weak entities), attributes, relations, and lines as connectors [10].

MySQL is a relational database management system (DBMS) that is renowned for its open-source nature, high popularity, and fast performance. The advantages of MySQL include its open-source status, fast performance, ease of use, scalability, broad community support, replication, and standard SQL support. These characteristics make MySQL a common choice in various web and business applications. MySQL is used to define data structures, manage data within the database, set security rules, and efficiently manage the database [11]. In this study, the system design utilizes the Unified Modelling Language (UML).

## **2.2. Development methods**

We researched to help improve the quality and service in the registration process for the Tamyiz Digittren program. This study aims to produce a database design that meets the needs of the new student registration system at Tamyiz Digittren and to implement this design using MySQL as the Database Management System (DBMS) and PHP as the programming language. It is expected that the development of this database can contribute positively to the development of the new student registration system at Pondok Pesantren Bayt Tamyiz.

Database design varies depending on business needs, type of data, scale, database software, current technology, purpose, environment, and existing limitations and constraints. Generally, database design begins with the requirement analysis stage, where the business or organizational needs that affect the structure and function of the database are identified. Subsequently, designers create a conceptual model that is independent of any specific database technology, which includes entities, attributes, and relationships between entities. This model is then transformed into a more specific and structured logical model, involving the identification of relational schema, tables, and keys. The normalization process is carried out to reduce data redundancy and ensure the structural cleanliness of the database. After that, physical design is undertaken, which involves implementing the logical database design into a specific Database Management System (DBMS) by determining data types, indexes, and keys. Next, the database is implemented and tested to ensure it meets functional and performance requirements. Finally, the database must be routinely managed and maintained, including backups, updates, data integrity maintenance, and performance monitoring.

In practical terms, database development cannot perfectly fulfil all the above steps. This is due to time constraints, limited information from users, and cost limitations. Therefore, in this study, we have condensed the design phases into just three stages:

---

## **3. Analysis of needs and business processes**

### **3.1. Design of database structure**

#### *3.1.1. Implementation of the DBMS*

Several steps that have been condensed include the process of information gathering, normalization, technology selection, maintenance, system backup preparation, updates, and maintenance. Nevertheless, the results can be used to support the registration system with minimal corrective processes. The key lies in information gathering and an experiential approach.

---

## **4. Results and discussion**

In this study, we employed a practical approach. We implemented only three main stages: needs analysis, database design, and implementation. We did not specifically plan any other stages.

### **4.1. Needs Analysis**

Need analysis is systematic process of identifying and evaluating [12]. In this stage, we needed to understand the information and requirements associated with database development. The information gathered was then analysed to ensure the accuracy of the data needed for database design. To obtain the appropriate data, we relied solely on primary data sources. Primary data is data obtained directly from sources, such as through questionnaires, interviews,

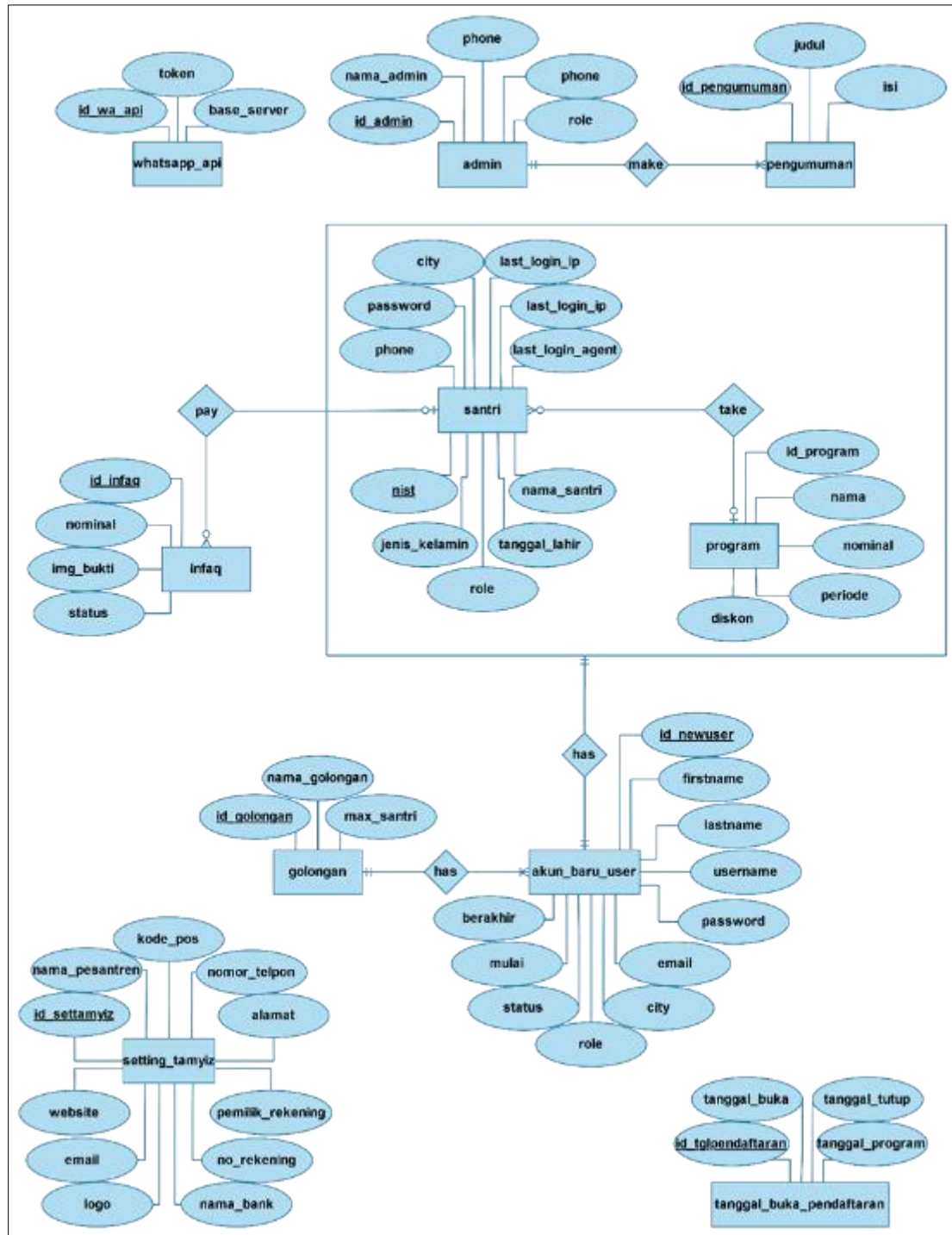
observations, or experiments [13]. The main purpose of needs analysis is the user's satisfaction. In this research, we collected primary data through interviews or discussions with relevant informants, namely the administrators of Pondok Pesantren Bayt Tamyiz. The information obtained from these interviews can be found in Table 1.

**Table 1** Interview results

<b>Interview Stages</b>	<b>Information Obtained</b>	<b>Steps in the Design Process</b>
Identifying related issues at Bayt Tamyiz Boarding School	Pondok Pesantren Bayt Tamyiz faces several issues, including new student registrations still being conducted manually with limited transaction records, program payments and donations that must be made directly at the office, and a lack of validation processes in payment procedures.	To address the challenges of manual new student registrations with transaction limitations, program payments and donations made directly at the office, and the lack of validation processes in payments, Pondok Pesantren Bayt Tamyiz can take solution actions that include implementing an online registration system, using electronic payment systems, and applying validation processes in the payment system. These steps are expected to enhance the efficiency and accuracy of the boarding school's administrative processes and expand accessibility for learners.
Understanding business processes, analysing database requirements, and designing the system.	In its operations, the Pondok Pesantren Bayt Tamyiz involves main business processes, which require a deeper understanding of the business activities being conducted. These business processes greatly necessitate initial database design and user interface (UI) planning.	Pondok Pesantren Bayt Tamyiz requires a deeper understanding of its business processes, which greatly necessitate initial database and user interface (UI) design. The next step to be taken is to conduct a thorough analysis of these business processes to understand the needs and challenges faced. Following this, it is necessary to identify the required data needs and design an appropriate database structure, as well as develop an intuitive user interface. A testing and evaluation phase is then carried out to ensure suitability and effectiveness in supporting the boarding school's business processes.

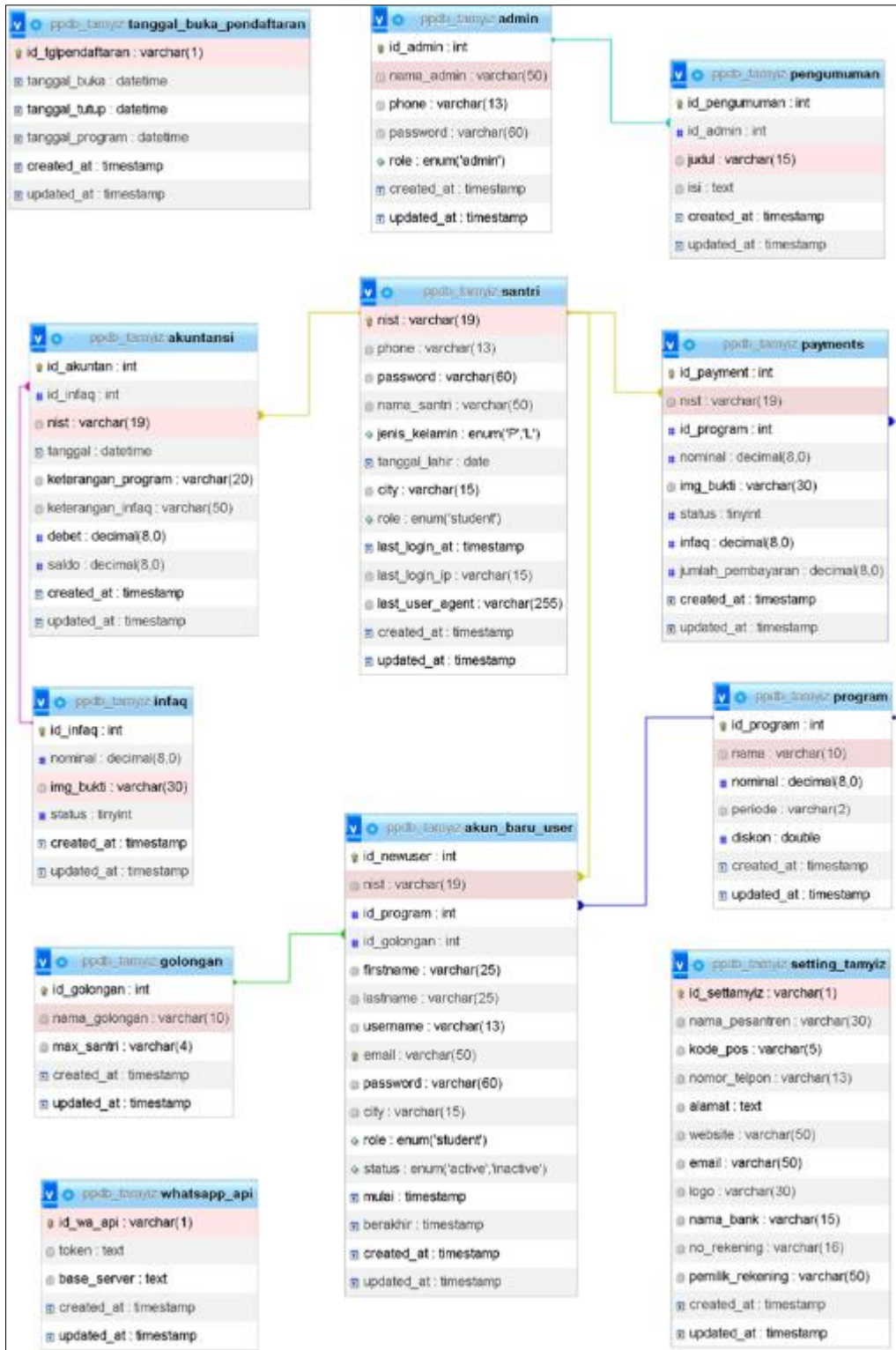
#### 4.2. Database Design

In the design of the database structure, the first stage is conceptual design. This stage includes determining entities, relationships between entities, and attributes needed to store data efficiently. Next, an Entity-Relationship Diagram (ERD) is created, which aims to provide a visual representation of the database structure, including entities, attributes, and relationships between entities. After that, we proceed with normalization steps to optimize the database structure by eliminating redundancy and minimizing data anomalies [14]. By using such an approach, database design can be carried out systematically and efficiently, ensuring that the database can store and manage data effectively according to the business needs of Tamyiz Digittren. Figure 1 shows the results of the ERD creation.



**Figure 1** Entity Relationship Diagram of Tamyiz Digtren

Next is the stage in database design called the logical level. At this stage, the database designer maps from the ERD (Entity-Relationship Diagram) to a more concrete database structure, namely the relational database model. This process involves converting entities, attributes, and relationships identified in the ERD into tables, columns, and keys in the relational database. In this context, the relational database model refers to an approach in database design that uses tables to store data, where each table represents an entity in a business or organizational domain, and columns in the table represent attributes or properties of that entity. Relationships between entities are represented by foreign keys that link columns in different tables. By mapping the ERD into table form, the logical level database design stage ensures that the database design accurately reflects the structure and relationships between data [15], which will form the foundation for the implementation and use of the database.



**Figure 2** Relationship between tables in the Tamyiz Digittren registration database

Based on the logical database design that has been conducted, the formed database consists of 12 tables. Each table has a variety of columns representing different data items. Figure 2 shows the relationships between tables in the New Student Registration System at Tamyiz Digittren.

### 4.3. Implementation Stages

We implemented the database design using MySQL software Version 8. The implementation was carried out using Laravel's Object Relation Mapping to form a database model that provides access to registration data from the MySQL database. The MySQL database was tested using anomaly testing methods and view checks. The test results showed that the database implementation went as expected and the displayed data met the established criteria. Overall, the development of the MySQL database for the new student registration system at Pondok Pesantren Bayt Tamyiz has been successful. The MySQL-based database development has been able to serve as a suitable database for the needs of the new student registration system for Tamyiz Digittren. The database development is expected to provide a solid foundation for the development of the new student registration system at Pondok Pesantren Bayt Tamyiz.

## 5. Conclusion

Based on the research conducted, it has been concluded that an operational database has been successfully developed, ready to support the development of a new student registration system at Tamyiz Digittren. This database has undergone a series of design and testing processes and has proven to be free from testing anomalies that could lead to data inconsistency or data loss during deletion. Therefore, it is expected that this operational database can provide an effective solution to overcome the issues of managing new student registration data that has previously been done manually. Moreover, the developed database is ready to be integrated with the new student registration system at Tamyiz Digittren, allowing the registration process, student data storage, and related data management to run efficiently.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

## References

- [1] M. Falikul Isbah, "Pesantren in the changing Indonesian context: History and current developments," *Qudus International Journal of Islamic Studies*, vol. 8, no. 1, pp. 65–106, 2020, doi: 10.21043/QIJIS.V8I1.5629.
- [2] K. Iskandar, "Lembaga Pendidikan Pesantren di Tengah Arus Perubahan Global," *Journal of Education and Religious Studies*, vol. 3, no. 01, pp. 18–24, Apr. 2023, doi: 10.57060/jers.v3i01.73.
- [3] A. Rosalia and U. Muzayanah, "The Role of Islamic Boarding Schools (Pesantren) in Community Social Life," February, 2024. [Online]. Available: <https://irdhjournals.com/ijsch>
- [4] B. Rawat and S. Purnama, "MySQL Database Management System (DBMS) On FTP Site LAPAN Bandung," *International Journal of Cyber and IT Service Management (IJCITSM)*, vol. 1, no. 2, pp. 173–179, 2021, doi: 10.34306/ijcitsm.v1i1.47.
- [5] G. Jindal, R. Devi, and S. Bali, "Hierarchical Model Leads To the Evolution of Relational Model," *International Journal of Engineering and Management Research*, vol. 2, no. 4, 2012, [Online]. Available: <https://www.researchgate.net/publication/284180806>
- [6] R. Mosca, M. De Santo, and R. Gaeta, "Ontology learning from relational database: a review," *J Ambient Intell Humaniz Comput*, vol. 14, no. 12, pp. 16841–16851, Dec. 2023, doi: 10.1007/s12652-023-04693-8.
- [7] K. Sima, "Initiating a Project, the right way," 2022. [Online]. Available: <https://www.researchgate.net/profile/Kifle-Sima/research>
- [8] Nofiyani, "MODEL BASIS DATA UNTUK MENDUKUNG SISTEM ADMINISTRASI PELAYANAN DAN PERBAIKAN MOTOR," pp. 978–623, 2019, doi: 10.30998/simponi.v0i0.333.
- [9] Weiskhy Steven Dharmawan, "PENERAPAN SISTEM INFORMASI AKUNTANSI PENGELOLAAN KEUANGAN BERBASIS WEBSITE," *JUSTIAN, Jurnal Sistem Informasi Akuntansi*, vol. 4, no. 1, pp. 74–83, 2023.
- [10] · Book, "RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)," 2020. [Online]. Available: <https://www.researchgate.net/publication/344806128>
- [11] J. Wahyudi, M. Asbari, I. Sasono, T. Pramono, and D. Novitasari, "Database Management in MYSQL," 2022.

- [12] M. J. Betti, "Needs Analysis," 2021. [Online]. Available: <https://www.google.iq/search?q=needs+analysis&e>
- [13] E. Daryanto and D. Darwin, "Needs Analysis and Implementation Training Management Model Development," European Alliance for Innovation n.o., Mar. 2020. doi: 10.4108/eai.16-11-2019.2293238.
- [14] [H. Gaussdb, "Database Principles and Technologies-Base On Huawei GaussDB," 2023.
- [15] D. R. Hamad, "Logical Database Design," 2016.