

Business Process Analysis and Information System Design to Support IT Governance Practices in Construction Services

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Abstract— This study aims to analyze system requirements and design a web-based company profile information system to support the effectiveness of IT governance in a construction services organization. This study occurred due to the lack of a structured and integrated information system, which led to inefficient information delivery and limited accessibility for stakeholders. A qualitative approach was used through observation and interviews to identify system requirements and analyze existing business processes. Business process modeling was performed using Business Process Model and Notation (BPMN) to describe the current (as-is) and proposed (to-be) processes. Next, the system design was developed using Unified Modeling Language (UML), including Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams to provide a structured overview of the system. The database was designed using Entity Relationship Diagrams (ERD) to ensure structured and integrated data management. The system design provides a structured overview to manage and convey company information more efficiently. Data in the system is managed by the administrator and accessed dynamically by users. In addition, this design supports the principles of IT governance by ensuring alignment between business processes and information technology, improving data management, and increasing transparency and control. This study concludes that the designed system can improve the effectiveness of information management and contribute to better IT governance. Further research is recommended to implement and evaluate this system in a real-world environment.

Keywords: BPMN, UML, ERD, Requirements Analysis, IT Governance

I. INTRODUCTION

Information technology is currently developing rapidly and plays a vital role in the lives of organizations and

companies [1], [2]. The use of information technology is now pervasive throughout a company [3], [4]. One common implementation of information technology in companies today is the development of a website in the form of a company profile, which contains information about the company's identity, vision, mission, services, achievements, and other relevant information from the company to users[5].

This problem is also still frequently found in organizations engaged in the construction services sector, where the company does not yet have a structured and well-integrated company profile system. As a result, the delivery of information regarding the company profile, project services, and work portfolio is still not well digitized. The information presented is still not systematically organized and is sometimes difficult to update. This makes the delivery of company information to external parties or customers less effective and can reduce company performance, especially in the form of communication or the delivery of company information. The company is seen as less than optimal in utilizing existing technological developments in today's era. Changing the company profile to a web-based is a complete complement that meets the strategic needs that must be owned by all companies because it will affect how the company competes with other companies competitively, increase the company's business credibility, and will influence how the public perceives the company's potential, thereby increasing market reach and also investment in the company.

In developing an information system, the needs analysis stage is a very important step in identifying what needs are

needed by users and determining what elements are needed to make the system adaptive and support the company's operational activities[6]. Before identifying system and user needs, an analysis of the company's business processes is carried out regarding how the company's workflow and how this company delivers information to consumers[7]. This business process modeling can be done using the Business Process Model and Notation (BPMN) to describe business processes, allowing stakeholders to understand the sequence of activities and the parties responsible for their implementation and to identify gaps in business activities that will later be fixed. In addition, the Unified Modeling Language (UML) is also used to describe the structure required by the system and the system's workflow in detail such as Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams which will form a structured and systematic design in the development of the company's system.

Based on previous research, it is known that research related to information technology governance in general is still not much directly related to information system design, especially web-based company profile systems. Meanwhile, research on company profile website development tends to focus more on implementation without demonstrating the importance of requirements analysis and structured system modeling using BPMN and UML. This indicates a difference in research related to the integration of requirements analysis, system design, and the contribution of these systems to corporate information technology governance.

A well-designed information system is expected to support the effectiveness of information technology governance within a company [8]. With a structured system, information management will be more organized, business processes will become more efficient and aligned with the organization's main objectives. This web-based company profile information system, if successfully designed well, will also have a significant impact related to the effectiveness of information technology governance, such as improving aspects of leadership, organizational structure, and workflows that ensure that the information technology developed will have a positive impact, as well as expanding the organization's strategy in

ensuring alignment between business and company objectives utilizing technological developments.

II. LITERATURE REVIEW

This chapter analyzes the methods and conceptual framework that form the basis of this research. This review encompasses various theories related to system requirements analysis, the design of information systems for construction services, and information technology governance. The theories presented are drawn from articles in specialized journals relevant to the research objectives.

2.1 Information Systems in the Construction Sector

An information system is a combination of several interconnected components, including technology, people, data, and processes. Information systems also play a role in collecting[9], processing, storing, and disseminating information to support a company's decision-making process. Furthermore, the role of information systems in various sectors is increasing in line with the need for organizations to manage data or information quickly, accurately, and easily accessible. This will increase the effectiveness of company operations and provide high-quality information services to users.

In the construction sector, information systems also play a crucial role in managing unstructured information[10]. Because the construction sector has complex workflows involving many people, information systems are essential to help manage project data, streamline communication between parties, and improve coordination during work. This will minimize miscommunication, information delays, and a lack of transparency within the company.

However, not all construction companies can afford to develop a large-scale information system due to budget constraints and a lack of technology expertise[11]. Therefore, one easily adopted information system implementation by construction companies is the development of a company profile website. This website provides the benefit of conveying company information and making it easier for users to assess the company's information and credibility. This allows the company to

reach a wider market and open up opportunities to acquire new clients.

2.2 Website Company Profile

A company profile website is a web-based information system used by companies to convey information regarding their profile, vision and mission, services, achievements, and portfolio to the public[12]. This website serves as a crucial communication tool between the company and its stakeholders and enhances customer trust. Furthermore, having a website expands the company's market reach without geographical limitations, opening up opportunities for collaboration with various parties.

2.3 System Requirements Analysis

System requirements analysis is the initial stage in information system development, aiming to identify user needs and determine system specifications related to what is required to build a system[13], [14]. Observations and interviews are conducted to gather information about system requirements to understand how business processes operate and what the company needs[15], [16]. This requirements analysis will then form the basis for creating a system model using UML and BPMN. Both will help visually illustrate the company's system requirements and business processes.

2.4 Business Process Model and Notation (BPMN)

Business Process Model and Notation (BPMN) is a standard for modeling business processes, including company workflows, in a visual and structured manner using various symbols that are easily understood by various parties. BPMN is used to analyze current business processes (as-is) and design proposed business processes (to-be). This allows a company's business processes to improve through the implementation of structured information systems and reduce inefficiencies in existing processes. In the construction services sector, BPMN plays a crucial role in describing the flow of company information delivery to stakeholders. Thus, BPMN serves as the foundation for more effective system analysis and design processes.

2.5 Unified Modeling Language (UML)

Unified Modeling Language (UML) is a standard used to visualize object-based information systems. UML plays a role in describing system requirements, system structure, and interactions within the system in detail.

Some types of UML used in systems modeling include Use Case Diagrams, which represent the interactions between users (actors) and the system, and show their main functions; Activity Diagrams, which detail the system's workflow; Sequence Diagrams, which represent the sequence of interactions between system objects, providing a clearer view of the communication flow between its components; and Class Diagrams, which represent the data structure and relationships between the system's classes.

2.6 Entity Relationship Diagram (ERD)

An Entity Relationship Diagram (ERD) is a conceptual model used to describe the data structure in an information system. ERDs play a crucial role in database design before implementation. An ERD consists of several key components, such as entities that represent the main objects or data in the system, attributes that characterize the entities, and relationships that describe the relationships between entities.

2.7 Information Technology Governance (IT Governance)

Information Technology Governance (IT Governance) aims to ensure that the use of information technology within an organization aligns with business objectives, provides added value to the company, manages potential risks, and supports informed decision-making. The implementation of IT governance in this study is through the design of a web-based company profile information system that provides structured, easily accessible, and regularly updated company information. Therefore, with a system designed based on needs analysis and appropriate modeling, the company will be able to improve information management, clarify communication flows, and support alignment between technology and business objectives.

III. RESEARCH METHODOLOGY

This research uses a qualitative approach based on needs analysis and information system design and aims to

understand how companies convey company information to stakeholders, as well as formulate system needs that are appropriate to company conditions.

This research was conducted at a construction services company that did not yet have a web-based company profile information system. Consequently, company information was still delivered manually. This made information difficult to access widely and unorganized. Therefore, this research was conducted to support effective and efficient information delivery.

Data collection in this study was conducted through direct observation of ongoing business processes within the company and interviews with field supervisors at construction service companies to obtain information regarding system requirements, challenges faced by the company, and expectations regarding the system to be developed. Furthermore, a literature review was conducted on relevant research to obtain accurate information.

The following is a flowchart of the research stages for needs analysis and information system design in a construction services company.

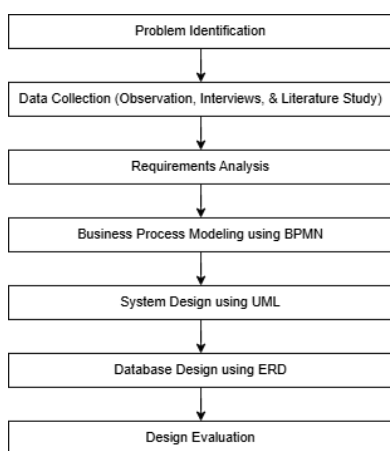


Figure 3. 1 Research Methodology

The image above shows several interrelated research stages. The first stage is problem identification to determine the obstacles faced by the company. Next, data is collected through observation and interviews to directly understand the company's condition. Furthermore, a literature review is conducted to obtain additional

information related to the problems faced. The data is then analyzed to determine system requirements. The results of the needs analysis are used as the basis for business process modeling using BPMN. Next, the system is designed using UML to describe the system design in a structured manner. Furthermore, the database design is carried out using Entity Relationship Diagrams (ERD) to illustrate the data structure and relationships between entities in the system. Then, the final stage in this research is an evaluation of the system design that has been created to ensure that the system is designed according to user needs and is able to support the company's business objectives.

IV. RESULT AND DISCUSSION

Based on observations and interviews conducted with construction service companies, it was discovered that the process of conveying company information is still done manually and has not been integrated with the information system. Similarly, information related to company profiles, services, and project portfolios is not systematically organized, making it difficult for stakeholders to access. This results in suboptimal information delivery to potential clients and limited marketing reach. Therefore, a web-based company profile information system is needed that can present structured information and be updated regularly.

4.1 Business Process Modeling and Notation (BPMN)

This stage describes the company's business process modeling for conveying company information before and after the system is implemented.

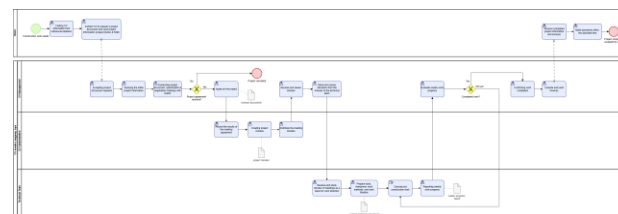


Figure 4. 1 Business Process Modelling and Notation (as-is) in a Construction Services Company

Figure 4.1 shows the current business process (as-is) in a construction services company, where company information is still delivered manually through direct

communication, and clients mostly find the company through recommendations from friends. Consequently, the company's market reach remains limited. This business process involves several stages, from handling project requests from clients to project completion. Based on the current business process, several obstacles can be identified, namely the manual process of delivering information, reliance on direct communication, and document management that is not yet integrated into a system. This results in a less efficient process and the potential for information delays.

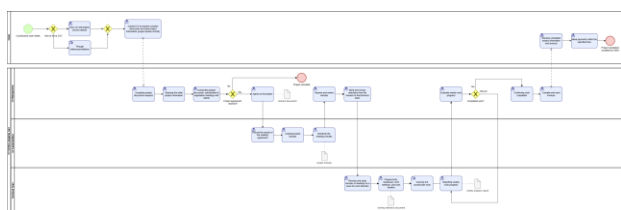


Figure 4. 2 Business Process Modelling and Notation (to-be) in a Construction Services Company

Figure 4.2 shows the proposed business process (to-be) after the implementation of a web-based company profile information system. The change lies in the initial stage, where clients can first access company information through the website before submitting a project request. Clients have two alternatives for finding company information: through the website or through recommendations from their contacts. With the company profile website, clients can independently obtain information regarding the company profile, services, and project portfolio without the need for direct communication at the initial stage. After obtaining the required information, clients can submit project requests, which are then processed by management through discussion and negotiation stages, until the project is completed, while still following the existing flow but supported by more structured information.

Based on a comparison between the current (as-is) and proposed (to-be) business processes, a key difference exists in the initial stage of client interaction. In the previous process, clients had to contact the company directly to obtain information, whereas in the proposed process, clients can access information independently through the website. This change has a positive impact in

the form of increased efficiency in information delivery and increased ease of access for clients. Therefore, the designed system not only improves business processes but also supports the effectiveness of information technology governance within the company.

4.2 System Design Using UML

The system design in this study was carried out using the Unified Modeling Language (UML) to describe system requirements in a structured manner. UML is used to model the system to make it easier to understand, both from the user and developer perspectives and to describe user interactions with the system, process flows, and the structure of the system to be built. In this study, several types of UML diagrams were used, including Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams. Each diagram has a different role in describing the system, so it can provide a comprehensive picture of the web-based company profile information system being designed.

4.2.1 Use Case Diagram

Use case diagrams are used to illustrate the interaction between users and the system, as well as the functions available within the system.

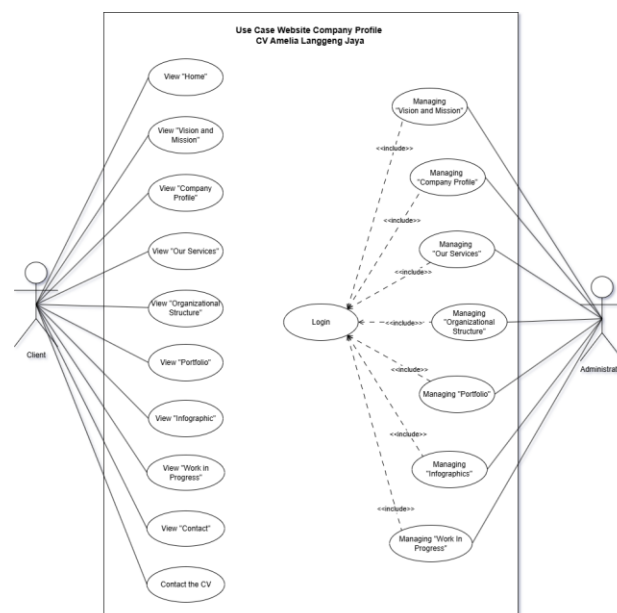


Figure 4. 3 Use Case Diagram Website Company Profile

Figure 4.3 shows that the system has two main actors: clients and administrators, who have different access rights. Clients act as general users who access information available on the company profile website and can view various information provided by the system. Furthermore, clients can also interact with the system through the contact company feature. Meanwhile, admins have full access rights to manage content within the system. Managing this information begins with the login process, as indicated by the "include" relationship.

This diagram demonstrates that the system is designed with a clear division of access rights between general users (clients) and administrators. Clients can only access available information without modifying it, while administrators have full control over managing system content. This aims to maintain the security of company data and manage the information displayed to the public.

4.2.2 Activity Diagrams

Activity diagrams are used to describe the flow of activities within a system in greater detail. In this study, the activity diagram is divided into two parts, there are admin activities and user (client) activities. This separation is made to clarify the different roles, and interaction flows of each actor within the system.

4.2.2.1 User Activity Diagram (User/Client)

Figure 4.4 shows user activity when accessing a web-based company profile system. The process begins when the user opens the website and then selects the menu or information they wish to view, such as the company profile, services, portfolio, or other information. This activity diagram depicts the user activity flow, designed to be simple and easy to understand.

4.2.2.2 Admin Activity Diagram

Figure 4.5 shows the admin's activities in managing the system, starting with the admin logging in. After successfully authenticating, the admin can access various data management features. Any data changes made by the admin are stored in the system and directly affect the information accessible to users. This diagram demonstrates that the admin's activity flow is more

complex than that of the user because it involves data management processes.

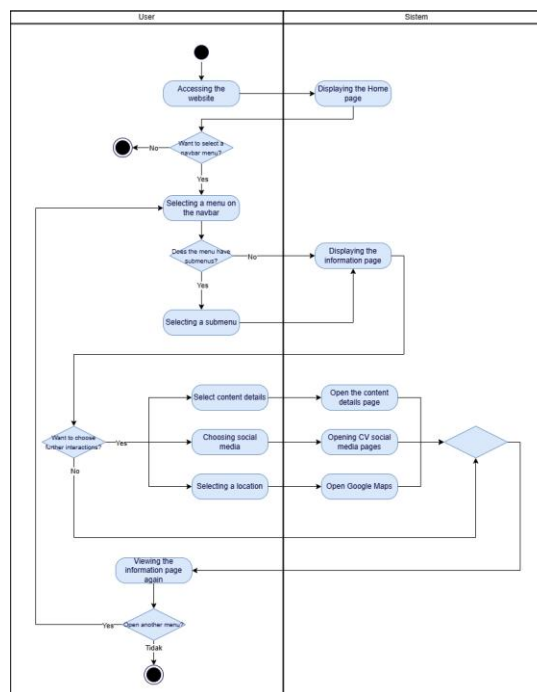


Figure 4.4 User Activity Diagram

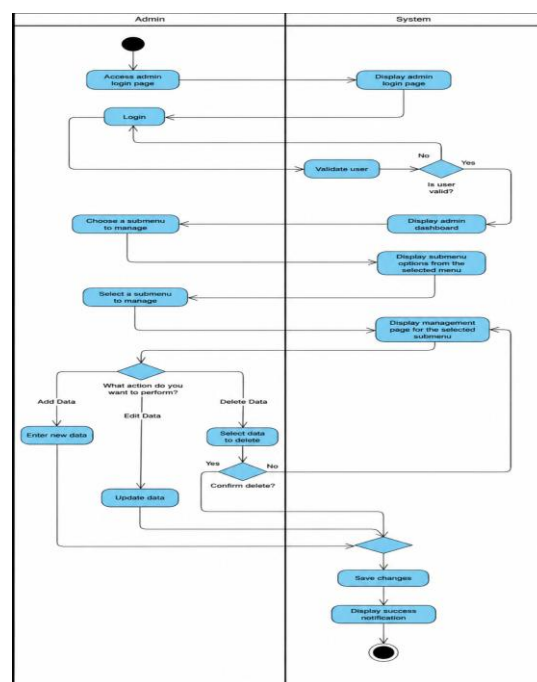


Figure 4.5 Admin Activity Diagram

4.2.3 Sequence Diagram

Sequence diagrams are used to represent the interactions between objects in a system based on a chronological sequence. In this study, the sequence diagram is divided into several sections: the admin login process, data management by the admin, and user interaction in accessing information. This division is done to make the system flow easier to understand and less complex.

4.2.3.1 Admin Login Sequence Diagram

The image below shows the admin login sequence diagram.

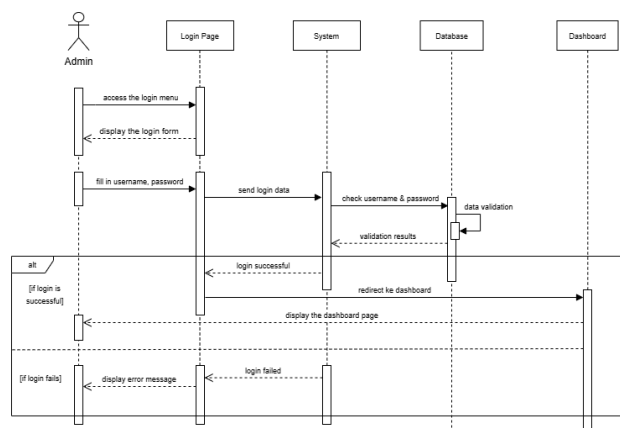


Figure 4. 6 Admin Login Sequence Diagram

According to figure 4.6, the login process is performed by an admin. The process begins when the administrator enters their username and password into the system. The system verifies the information. If it is valid, the system grants the administrator access to the control panel. If it is invalid, the system displays an error message and prompts the administrator to repeat the login process.

This diagram demonstrates that the login process includes authentication, the purpose of which is to maintain system security so that only authorized users can access data management functions.

4.2.3.2 Admin Data Management Sequence Diagram

This diagram shows how the system responds to each admin action sequentially until the data is successfully updated.

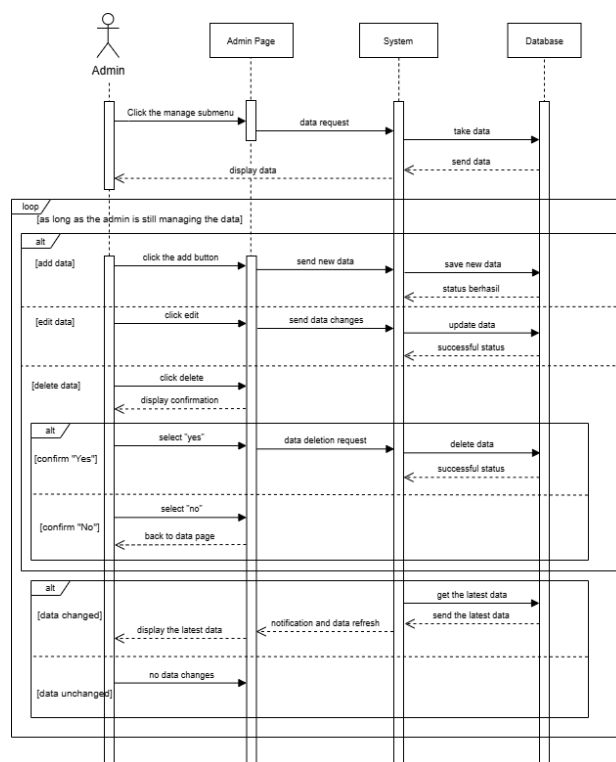


Figure 4. 7 Admin Data Management Sequence Diagram

Figure 4.7 illustrates the interaction between the admin and the system when managing data. After successfully logging in, the admin can select the feature they wish to manage. The system then processes the request and displays the selected data. The admin can make changes to the data, such as adding, modifying, or deleting information. Each change is saved to the database and displayed back in the system.

4.2.3.3 User Sequence Diagram

This diagram demonstrates that the user's interaction with the system is simple and focused on information access.

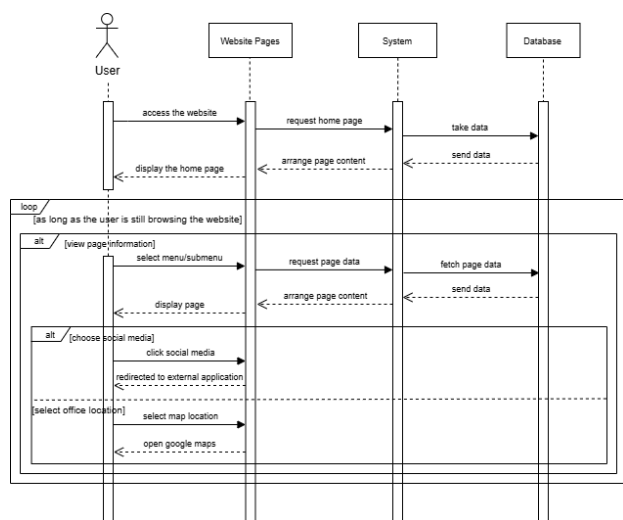


Figure 4. 8 User Sequence Diagram

Figure 4.8 shows the user's interaction with the system when accessing information. The process begins when the user opens the website and selects the desired menu item. The system then processes the request by retrieving data from the database and displaying it to the user. The user acts solely as a recipient of information without making any changes to the data.

4.2.4 Class Diagram

A class diagram describes the structure of a system, including classes, attributes, methods, and the relationships between these elements.

According to Figure 4.9, the system consists of several main classes with attributes for storing and managing data. The administrator class can manage a large amount of data for each entity, as demonstrated by the one-to-many relationships between the administrator class and the other classes. The other classes, on the other hand, function as repositories of primary information for user viewing. This diagram shows a structured and organized system where data management is handled by the administrator, while users only access the available information.

4.3 Entity-Relationship Diagram (ERD)

An ERD is used to illustrate the database and relationships between entities in a web-based company profile system.

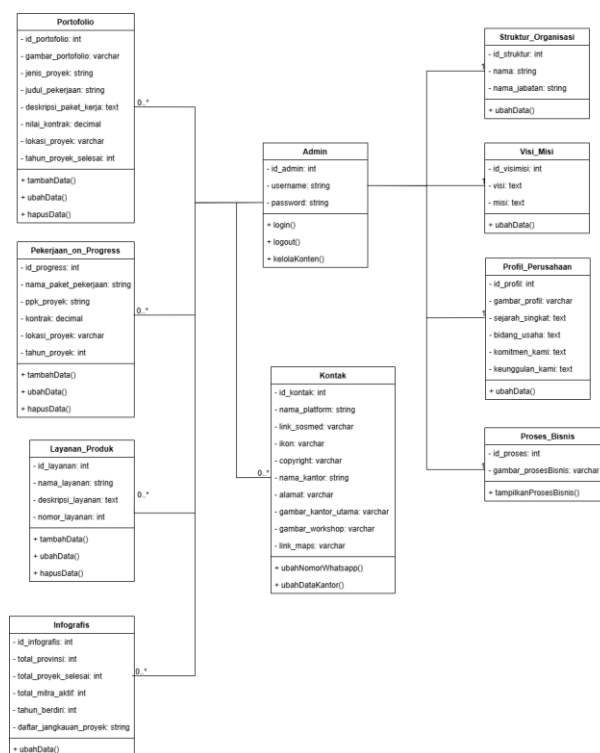


Figure 4. 9 Class Diagram

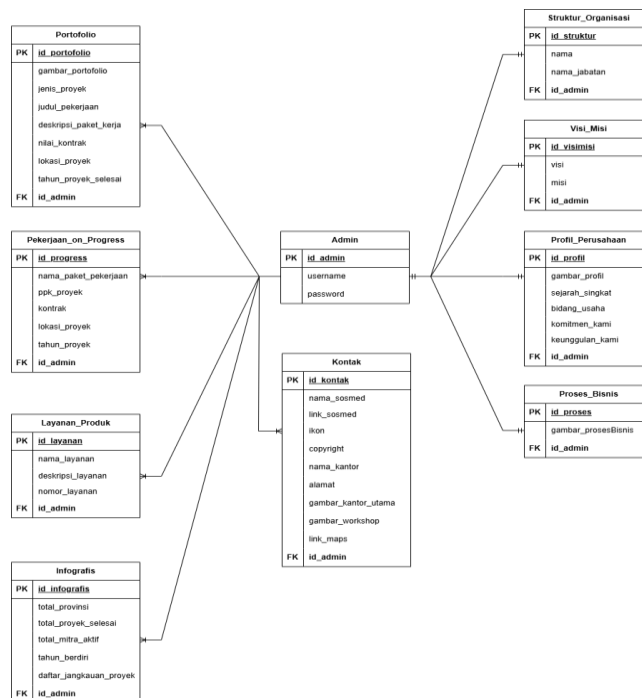


Figure 4. 10 Entity-Relationship Diagram

According to Figure 4.10, this system consists of several main entities with attributes in the form of fields, and a primary key that serves as a unique identifier for each piece of data.

The Administrator entity acts as the main data management center for the system. This is demonstrated by the relationship between the Administrator entity and other entities through the foreign key 'id_admin'. This relationship is one-to-many, where a single administrator can manage multiple records for each entity.

This ERD demonstrates that the system is designed with a centralized and organized database structure, which facilitates data management by administrators and ensures data integrity and consistency within the system. With clear relationships between entities, the system can store data efficiently and facilitate future system development and maintenance.

4.4 Analysis of the Relationship Between System Design and IT Governance

Based on the results of system analysis and design, a web-based company profile information system can improve the effectiveness of IT governance. This can be seen from an organized system structure, business process modeling that is clear and structured, and the division of roles and access rights between users and administrators.

These models can be augmented and translated into tools that would allow that system to be built. For example, the business process modeling notations (BPMNs) would say that this is the type of system that would support that business process. Another online pattern allows the use of UML to describe system requirements. The administrator is the main system manager and has strong data-control of the system. The system design will facilitate good IT governance to support IT governance with strategic alignment between technology and business.

V. CONCLUSION

This study aims to produce a company profile information system based for a web-based construction services company. The stages of designing a business process

analysis using BPMN (Business Process Model and Notation) describe the as-is and to-be models so that it can be seen what the problems in the manual process, which can later be resolved by the presence of a more orderly workflow design, followed by stages analysis and system design and system creation.

System design was carried out using UML (Unified Modeling Language) in order to model user requirements. The UML diagrams used in this research include Use Case Diagram, Activity Diagram, Sequence Diagram and Class Diagram. These show the flow of activities in the system and how each of the entities interact. The results of the design show that the system presents dynamic data to the users thus ensuring that the information being displayed is consistent, the database design was done using ERD (Entity-Relationship Diagram) shows that the system has structured and integration of the data in the system since all information in the system is centrally managed by the administrator. This facilitates data management and guarantees the consistency of the information displayed.

The system should build on current business processes and increase transparency, controlled data management and access rights, and efficiency of communication between the company and external parties. It can also lend greater power to knowledge management. Most importantly, this system design supports alignment between business and technology, thereby improving IT governance in the company. Although this research has produced a structured system design, there are several limitations that need to be considered. This research only focused on the requirements analysis and system design stages, so it did not include the implementation and direct system testing stages. Therefore, the effectiveness of the system in real use cannot be measured empirically. Considering these constraints, additional studies are advised to advance the system to the implementation phase, including the development of a user interface and system testing using specific methods to measure performance and usability. In addition, the system can be developed by adding more interactive features to improve its functionality.

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