

FINAL PROJECT

BASIC DESIGN OF MANAGEMENT INFORMATION SYSTEM FOR HOUSING CONSTRUCTION TO IMPROVE THE PRODUCTIVITY OF HOUSING DEVELOPMENT

**Submitted to the Universitas Islam Indonesia Yogyakarta to Fulfill the
Requirements to Obtain a Bachelor's Degree in Civil Engineering**



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PLAGIARISM STATEMENT

I declare that the Final Assignment report I prepared as a requirement for completing the Bachelor's degree program in the Civil Engineering Undergraduate Program, Faculty of Civil Engineering and Planning, Universitas Islam Indonesia is the result of my work. Certain parts of writing the Final Project report that I quoted from other people's work have been written in the source clearly in accordance with the norms, rules, and ethics of writing scientific papers. If in the future it is discovered that all or part of this Final Project report is not my own work or there is plagiarism in certain parts, I am willing to accept sanctions, including revocation of the academic title I hold in accordance with applicable laws and regulations.

Yogyakarta, 5 November 2024

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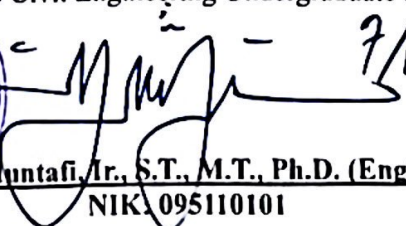
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ABSTRACT

Rapid population growth presents a significant challenge for many developing nations, including Indonesia. Over the past decade, Indonesia's population has grown from approximately 259 million in 2015 to an estimated 281 million in 2024. This surge has intensified the demand for adequate housing, creating a critical imbalance between population growth and housing availability, negatively impacting community welfare. Therefore, productivity must be tripled to meet the increasing demand for housing. An integrated and efficient management approach, such as using information systems tailored for the construction industry, is essential to achieve these goals.

This research analyses and designs a basic information system for housing construction to improve productivity. The design method will first determine the vision goals, then identify stakeholders, analyse current conditions, and determine the housing model and information system design. After the outcomes of the analysis method have been obtained, the information system can be designed using a context diagram and a data flow diagram.

The result of the analysis shows that the current housing construction process needs to be improved. The stakeholders involved such as the Government, Developer, Community, Bank, Admin, Supplier, Housing Institution, Insurance Institution, Earthquake Expert, and Project Owner all play an important role in running the information system. Therefore, this basic design will be conducted in more detail and further developed by an IT expert to be created in the form of a web.

Keywords: Productivity, Housing Construction, Information System, Stakeholder, Context Diagram, Data Flow Diagram

FOREWORD

The author would like to thank Allah SWT for His guidance in completing the Final Project titled “Basic Design of Management Information System for Housing Construction to Improve the Productivity.” This Final Project is one of the academic requirements for completing the Civil Engineering Undergraduate Program, Faculty of Civil Engineering and Planning, Universitas Islam Indonesia, Yogyakarta. The researcher faced several obstacles in preparing this Final Project, but thanks to various people's suggestions, criticism, and encouragement, this Final Project was completed. In this regard, the researcher would like to express their deepest thanks to:

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Finally, the researcher hopes this final project will be useful to various people who read it.

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Researcher,

Hafizh Sollery Summa Oliva Arham

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CHAPTER I

INTRODUCTION

1.1 Background

Rapid population growth is one of the main challenges faced by many developing countries, including Indonesia. In the last few decades, Indonesia has witnessed a significant increase in population, from a population in 2015 of around 259.100.000 people to now being estimated to reach more than 281.603.800 people in 2024. According to Badan Pusat Statistik Indonesia (2024), specifically in Yogyakarta, the population grew from 3.669.199 in 2015 to 4.126.444 in 2024. This growth impacts various aspects of life which increases the need for adequate housing significantly. The imbalance between the rate of population growth and the provision of liveable housing is a crucial issue that affects the quality of life and welfare of the community.

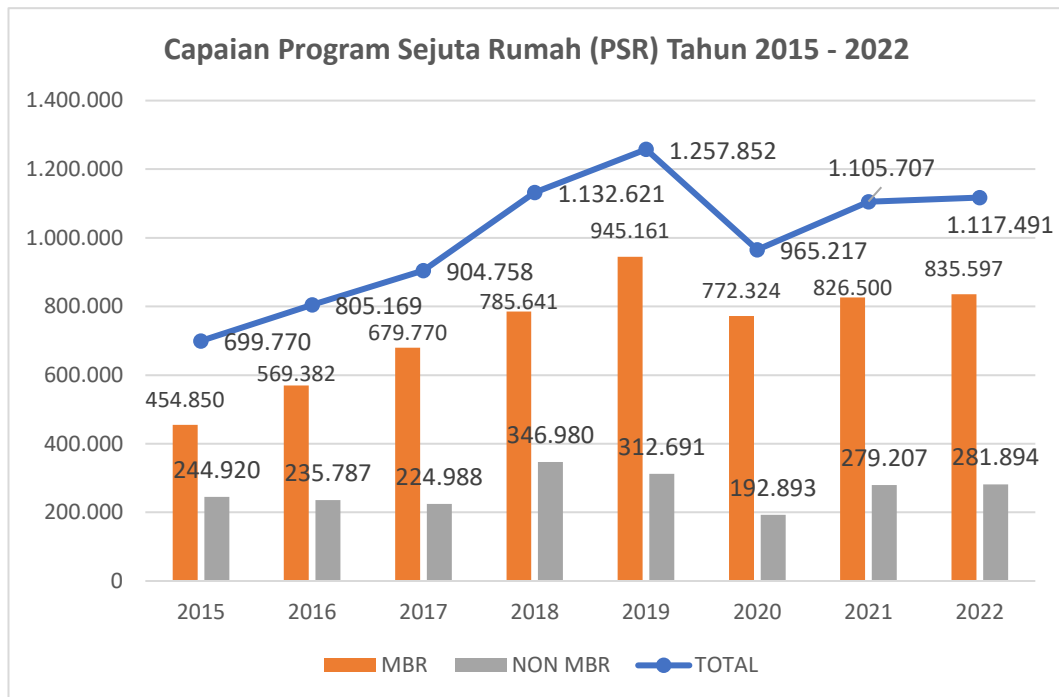
On April 29, 2015, the President of the Republic of Indonesia launched the One Million Houses Program. This program aims to overcome the housing backlog problem that has long been an issue in Indonesia. Housing backlog refers to the gap between the need for housing and the number of available homes. Through the One Million Houses Program, the government is trying to provide adequate housing for low-income people (MBR) and non-MBR people to meet housing needs that are increasing along with population growth. This program involves stakeholders, including central and regional governments, property developers, banks, and the community.

Indonesia's capacity in the production of liveable houses from 2015 is seen in Table 1.1.

Table 1.1 Achievement of 1 million Houses a Year Program

Number	Year	Achievements (units)
1	2015	699.770
2	2016	805.169
3	2017	904.758
4	2018	1.132.621
5	2019	1.257.852
6	2020	965.217
7	2021	1.105.707
8	2022	1.117.491
	Total	7.989.483
	Average	998.685

Source: (Capaian Program Sejuta Rumah, 2023)



Source: (Capaian Program Sejuta Rumah, 2023)

Figure 1.1 Achievements of the 1 million Houses Program

Based on the table and figure above, productivity has increased but is still very low compared to community needs. Meanwhile, the requirements are shown in Table 1.2.

Table 1.2 Target for Achieving Sufficiency in Housing

Year	Targeted achievement of the constructed house	Year	Targeted achievement of the constructed house	Year	Targeted achievement of the constructed house	Year	Targeted achievement of the constructed house
1	2,822,205	7	2,872,706	13	2,926,251	19	2,983,022
2	2,830,418	8	2,881,414	14	2,935,483	20	2,992,811
3	2,838,711	9	2,890,207	15	2,944,807	21	3,002,696
4	2,847,086	10	2,899,087	16	2,954,221	22	3,012,678
5	2,855,543	11	2,908,053	17	2,963,728	23	3,022,758
6	2,864,083	12	2,917,108	18	2,973,328	Average	2,917,108

Source: Musyafa (2023)

With an average housing need of almost 3 million houses, we must increase the current productivity three times and build three times the production capacity from today. Therefore, it requires integrated and efficient management. One management tool that can be used is an information system, specifically for the construction industry.

Several studies have been conducted previously regarding developing information systems for construction services. One of them is a study conducted and completed by Wardhani et al. (2023) in which the objective was to develop a service management information system in construction associations for better performance. This study only focuses on the construction service management information system to help in processing Membership Card (KTA) and Business Entity Certificate (SBU) data.

Based on the limitation of the previous research, the purpose of this study is to conduct a more detailed information system design. Therefore, this research and planning will cover a wider range of elements that will be included in the design.

According to (UU No 2 Tahun 2017), information systems must be created by the construction services community, which has authority. Specifically, the parties that have authority in managing the information system are the Central Government, Provincial Government, Regency/City Government, and the community of construction service can also be involved.

1.2 Problem Formulation

From the background explanation above, a problem must be addressed, formulated, and immediately solved. The problem is what kind of information system design is suitable for housing development in Indonesia?

1.3 Research Objectives

Based on the problem formulation above, the objective of this research and planning is to create an initial design of an information system that is suitable for housing development in Indonesia. Thus, this planning or design can be further created in the shape of a web by IT programmers and be further used by the district.

1.4 Research Significance

By planning an information system that complies with existing regulations, the significance is a management information system hopefully will simplify the construction process for various stakeholders, increase productivity, have higher quality, and increase efficiency.

1.5 Research Limitations

Following the research objectives, so that the scope of the research is clearer and more focused, it is necessary to have a problem boundary. This information system design consists of only an Information System sketch along with its descriptions.

CHAPTER II

LITERATURE REVIEW

2.1 General

In this chapter, several journals discuss a related topic to the planning and management of information systems. Further descriptions of previous studies regarding this topic and their limitations are presented in this chapter.

2.2 Procurement Planning of Liveable Housing in Time Series

This journal, written by Musyafa (2023), discusses how ideally, the supply and demand for a commodity or service should be balanced, including the availability of liveable housing for the community. In Indonesia, the government, developers, corporate social responsibility programs, and communities all work to provide liveable housing to the general people. Currently, the town is experiencing a severe shortage (backlog) of liveable homes. The present supply is expected to help lessen or eliminate the backlog. The goal of this study is to compute demands and procurement in a time series such that the supply-demand balance for liveable houses can be realized. This computation uses the following methods: a. Develop concepts and variables for calculating the need for liveable houses and procurement based on the liveable house's realistic production potential, b. Look for relevant data available online that is valid for these calculations, and c. Conduct trial and error to ensure a supply-demand balance at a realistic time based on the amount of the backlog value and the existing build capacity. According to the findings of this analysis, if a supply of around 2.7 million liveable housing units per year begins in 2023, the balance between supply and demand will be achieved by the end of 2048.

2.3 Analysis and Development of Management Information Systems

This Journal, written by Oktaviyana et al. (2023) discuss how currently; the development of information technology is very rapid. An information system is needed in human life. One of the functions of information systems technology is to help or encourage human work to run more effectively and efficiently. Information systems development has many diverse methods and platforms. The platform that

can be used in developing information systems is a platform mobile, web, or desktop-based. Management of information systems is part of the internal control of a business which includes utilization, documents, technology, and procedures that are managed to solve business problems such as the cost of a product, service, or a business strategy. So, the management of an information system in a business or company has a purpose in terms of collecting, processing, storing, and analyse information which will then be distributed for more specific purposes. Information Systems from every era will always be experiencing changes and development of information systems. From year to year, the information system is becoming more advanced, and more modern and the coverage of information is wider. Information system development starts from the level of community needs. The public's need for information systems will make the information system faster when undergoing development.

2.4 Information System Using the Rapid Application Development Method

This journal, written by Rusdianto et al. (2023) discusses how the use of information systems for ordering graphic design services at this time is almost in all institutions or companies, both small-scale companies let alone large-scale companies, to support their business activities. CV Samudra Biru as a growing company engaged in the manufacture of graphic design services, has a vision of providing the best service for its customers, so to realize this vision CV Samudra Biru requires an information system that aims to provide convenience and the best service for its customers. The information system in this case is a website that provides a menu for ordering graphic design services, which is tailored to the needs of consumers. this aims to make it easier for customers to order graphic design services. The development process in this study uses the PHP programming language and MySQL database. The methods used in the data collection process include literature study, interviews, and observation. The system design and development process use Rapid Application Development (RAD) and the system development model uses the prototyping method. For the process of testing the system, the researchers used the black box testing method. With this information

system, it is hoped that it can help consumers if they want to get graphic design services, whenever and wherever consumers want.

2.5 Stakeholder Obligations and Social Responsibility on Corporate Reputation

This Journal, written by Manik & Ardiana (2023) discusses how the purchasing power of the community continues to increase towards food and beverage products, leading to the active production of companies in the food and beverage industry. Some companies pay attention to their social responsibility towards the surrounding environment. Therefore, involving stakeholders and disclosing Corporate Social Responsibility (CSR) in company operations, it can help address damage to the company's image. This research aims to determine the influence of stakeholder engagement practices and CSR activity disclosure on corporate reputation. The sampling method used in this study is purposive sampling, with a total of 38 observations. The research findings indicate that stakeholder engagement and corporate social responsibility disclosure have a positive and significant impact on corporate reputation. The implication of this research is to provide input to company management to disclose CSR activities consistently and involve stakeholders inclusively.

2.6 Summary of Research

The differences in the objectives and the output from previous research are explained in Table 2.1.

Table 2.1 Summary of Research

Aspect	Previous Study				Present study
	Musyafa (2023)	Oktaviyana, Aritonang, & Sembiring (2023)	Rusdianto, Nurhayati, Aksani, & Rudianto (2023)	Manik & Ardiana (2023)	Arham (2024)
Title of Study	Procurement Planning of Liveable Housing in Time Series	Analysis and Development of Management Information Systems	Development of Graphic Design Service Order Information	The Impact of Stakeholder Engagement and Social Responsibility	Basic Design of Management Information System for Housing

Continued Table 2.1 Summary of Research

	for Balancing the Supply- Demand		System Using Rapid Application Developmen t Method	on Corporate Reputation	Construction to Improve Productivity
Purpos e of Study	To compute demands and procurement in a time series such that the supply-demand balance for liveable houses can be realized.	Understandin g Management Information Systems Analysis	To develop an information system that aims to provide convenience and the best service for its consumers.	To determine the influence of stakeholder engagement practices and CSR activity disclosure on corporate reputation.	To create an initial design of an information system that is suitable for housing development in a region of Indonesia
Method of Study	Formulate concepts for calculating the need for liveable houses and calculating the procurement , search for relevant data for these calculations, and do trial and error so that there is a supply-demand balance.	Platforms being used in developing this information system are mobile, web, or desktop-based platforms.	The system design and development process uses Rapid Application Development t (RAD), the system development the model uses the prototyping method, and the process of testing the system uses the black box testing method.	The sampling method used in this study is purposive sampling, with a total of 38 observations .	The basic design of this information system uses the context and data flow diagram.
Output of Study	A balance of demand and procurement can occur over 25 years with production of 2,652 to 2,843 million housing units annually.	Computer technology has made a positive contribution to management information systems. MIS is also very needed by	An Information System that can help consumers to get graphic design services, whenever and wherever	It can provide input to corporate management to consistently disclose CSR and involve stakeholders	A Managemen t Information System that will increase productivity in the construction industry

Continued Table 2.1 Summary of Research

		leaders in an organization or company for decision-making that can be accounted for.	consumers want.	inclusively.	
The Difference with the Present Study	The present study uses an Information System as a solution to increasing productivity to increase the production of liveable housing to balance the supply-demand.	The present study analyses and develops a Management Information System for the construction industry.	The present study covers the development of a construction service Information System using the context data flow diagram method	The present study discusses the impact of stakeholder engagement and social responsibility in an Information System	

2.7 Originality of Research

Compared with previous studies, there are several differences with this final project. Firstly, the study by Musyafa (2023) focuses on procurement planning of liveable housing in time series to predict when the supply and demand of liveable housing needs will be balanced, while the present study analyses and designs an information system to increase the productivity of the construction industry so that the construction of liveable housing can balance the growing population of Indonesia. Secondly, for comparison with the study by Oktaviyana, Aritonang, & Sembiring (2023), the study only covers the analysis and development of management information systems, while the present study covers both the analysis and the basic design of the information system in a diagram. Thirdly, Rusdianto, Nurhayati, Aksani, & Rudianto (2023) developed of graphic design service order information system using a rapid application development method, while the present study develops a construction process information system using a context

data flow diagram method. Lastly, Manik & Ardiana (2023) discuss the impact of stakeholder engagement and social responsibility on corporate reputation using purposive sampling, with a total of 38 observations, while the present study also mentions the impact of stakeholder engagement in an information system, it uses interview and questionnaires as the source of data collection. A similar information system has been used in previous research by Sutjiadi (2021). The only difference it has with the previous research is the process being used in the system and the stakeholders involved in the system. Therefore, this concludes that the current research being done is original.

Even though the previous studies discussed a similar topic to the present study, each study has its differences towards the present study. This study mainly focuses on the basic design of information systems to increase productivity in the construction industry. Other than that, this study will also discuss how each stakeholder that is involved plays a significant role in the information system. These are the purposes of the present study, which ensure this study's originality and avoid plagiarism with the previous studies.

CHAPTER III

THEORETICAL BASIS

3.1 Introduction

The previous chapter stated that this study would describe Information System planning for the housing construction in Sleman and a literature review from numerous sources as a reference for this final assignment research. This chapter will explain and describe the theoretical basis for information system planning for housing.

3.2 Housing Demand

Housing demand is an important element that influences the development of the housing construction sector. Various factors, both internal and external, related to population, economic conditions, and government policies drive this demand. Indonesia is experiencing a significant imbalance between population growth and housing availability. This has resulted in a backlog or shortage of housing supply that continues to increase yearly.

3.2.1 Factors Affecting Housing Demand

One of the main causes of the increasing demand for housing is rapid population growth. Data from Badan Pusat Statistik Indonesia (2024) shows that Indonesia's population growth rate is around 1.25% per year, which has a direct impact on the need for new housing, especially in urban areas.

The ongoing process of urbanization in Indonesia has led to an increase in the concentration of the population in urban areas. According to Badan Pusat Statistik Indonesia (2024), around 56,7% of Indonesia's population now lives in urban areas, causing demand for housing in large cities to be higher than in rural areas.

3.2.2 Imbalance Between Housing Demand and Supply

Despite the increasing demand for housing, Indonesia's construction sector still faces challenges in meeting this demand. According to Badan Pusat Statistik Indonesia (2024), the housing backlog reached 12.7 million units in 2024, indicating that the housing supply is not keeping up with demand. The causes of this imbalance include:

1. **Slow Construction Process:** The housing development process in Indonesia often faces constraints in terms of efficiency and productivity. This is due to the lack of implementation of supporting technology in land acquisition and building permits, and not having an integrated management.
2. **Land Constraints:** In urban areas, land availability is a significant issue, which slows down the construction of new homes.
3. **Financing Issues:** The housing sector still relies heavily on funding from the banking sector, which can limit developers' ability to build new homes, especially for low-income segments of society.

3.2.3 Implications for Construction Productivity

The increase in demand for housing should be an opportunity for the construction industry to increase its productivity. However, the various obstacles above cause the housing construction process to be unproductive. Therefore, integrated management and innovation are needed in the management system and construction technology so that the housing sector can be more responsive to market demand and reduce the increasing housing backlog.

3.3 Integrated Management

Integrated management is a holistic approach that combines various disciplines, functions, and processes in one framework to achieve more effective and efficient goals. In the context of housing development, integrated management involves coordination between various parties and activities, including planning, design, procurement, construction, and operational supervision to ensure the smooth running of the development process from start to finish. This approach

allows for better collaboration between stakeholders, including government, developers, contractors, communities, suppliers, and financial institutions.

3.3.1 Principles of Integrated Management

Integrated management is based on several key principles that can be applied in the residential construction industry, including:

1. **Effective Collaboration and Communication**

Integrated management emphasizes open communication and collaboration between all stakeholders. In housing development, clear communication between developers, contractors, suppliers, and other stakeholders ensures accurate information and prompt action in addressing challenges that arise in the field.

2. **Optimal Resource Management**

This approach ensures efficient use of resources, be it manpower, materials, or time. With a good management information system, resource planning and management can be done in a more structured manner, thereby reducing waste and project delays.

3. **Improving Quality and Productivity**

Integrated management aims to improve the quality of the final project output through close monitoring and continuous improvement at every stage. In the context of residential construction, this approach will improve productivity by reducing errors, speeding up the decision-making process, and ensuring projects are completed on time.

4. **Risk Management**

The implementation of integrated management allows for earlier and more organized risk identification and mitigation. In housing development, risks related to material delays, weather changes, or regulatory changes can be anticipated and managed better.

In the context of housing development in Indonesia, implementing integrated management is very important to address existing challenges, such as the

imbalance between population growth and housing availability, as well as low productivity in the construction sector. A lack of coordination between stakeholders and fragmented project management often causes unproductive housing development.

With the implementation of an integrated information management system, developers can access project information in real-time, manage construction schedules, coordinate material procurement, and monitor workforce performance more efficiently. In addition, this system also allows for more effective collaboration between parties involved in the construction process, thereby increasing productivity, and reducing construction costs.

3.3.2 Implementation of Technology in Integrated Management

The development of information technology provides great opportunities for the implementation of integrated management in the housing construction sector. Technology-based Management Information Systems (MIS) enable the integration of data from various departments and functions, thus facilitating faster and more accurate decision-making. The implementation of technology, such as Building Information Modelling (BIM), Enterprise Resource Planning (ERP), and web-based project management systems, can significantly increase the efficiency of housing construction management and productivity.

In conclusion, one example of integrated management is the use of an information system. A management information system can centralize and streamline communication, data sharing, and decision-making processes. In essence, an information system as part of integrated management enhances transparency, accountability, and efficiency, leading to significant improvements in construction productivity.

3.4 Information System

According to O'Brien and Marakas (2009) in Oktaviyana et al. (2023) an information system is a combination of people, hardware, software, communication

networks, data sources, procedures, and policies that are well organized and can store, retrieve, and disseminate information in an organization.

Information systems can also be defined as a combination of information technology and human activities that use the technology to support operations, management, and decision-making within an organization. Information systems are not only limited to computer technology, but also involve broader aspects, such as data processing, communication, and interaction between entities involved in the system. According to Laudon and Laudon (2016), information systems are defined as components that interact with each other to collect, process, store, and distribute information to support decision-making, coordination, control, analysis, and visualization within an organization.

3.4.1 Information System Components

Based on the data obtained from interviewing several IT experts, information systems consist of several main components that work synergistically to support operational activities. These components include:

1. **Hardware**

Including computers, servers, network devices, and other technological infrastructure needed to run information systems.

2. **Software**

Applications and programs used to process data and information to support organizational needs, such as project management, financial reporting, and data processing.

3. **Data**

A key element in information systems. Data in information systems can be information related to construction projects, such as completion time, budget, material inventory, and human resources.

4. **Human Resources (HR)**

Personnel involved in operating information systems. HR skills and knowledge greatly influence the effectiveness of the system.

5. Procedures

Rules and policies used to manage and operate information systems, including procedures for data input, analysis, and report generation.

6. Communication Networks

A communication system that allows the exchange of information between various components and entities in the information system.

3.4.2 Information Systems in Construction Project Management

Information systems play a vital role in various aspects of construction project management. Some of its main roles include:

1. Increased Efficiency and Productivity

Information systems help reduce duplication of work, speed up the decision-making process, and provide real-time access to required data. Thus, operational efficiency and project productivity can be increased.

2. Time and Cost Management

Information systems enable project managers to monitor project progress directly through available reports, identify constraints and potential delays, and make necessary adjustments to keep the project on budget and schedule.

3. Resource Management

Information systems help in the proper allocation of resources, such as labour, materials, and equipment. With proper management, the potential for resource waste can be minimized.

4. Increased Communication and Collaboration

With information systems, communication between parties involved in a construction project, such as developers, contractors, suppliers, and the government, can be better established, reducing miscommunication, and accelerating problem-solving.

The use of information systems in the housing sector is also expected to increase productivity by reducing waiting times, improving coordination between stakeholders, and increasing transparency in project management. Thus, the imbalance between housing demand and supply capacity can be reduced, and the construction process can run more efficiently and on time.

3.5 Management Information System

According to O'Brien (2002) in Oktaviyana et al. (2023) management information system is an integrated system that provides information to support the operational activities, management, and decision-making functions of an organization. Management information systems are information systems that obtain output results using input and various processes needed to meet certain goals in management activities.

A Management Information System (MIS) in a construction process refers to a structured system that collects, processes, and disseminates information to support decision-making and facilitate project management activities. Key aspects of MIS in construction include project planning, reporting, analysing, scheduling, resource allocation, cost management, quality control, document management, and risk management. One method that can be used to help carry out project monitoring is the use of a project management information system to present information on the achievement of a project (Yoanda et al., 2023).

Overall, the Management Information System enhances transparency, efficiency, and accountability in construction projects by integrating data from various sources and providing real-time information to stakeholders at different levels of the organization. With the existence of MIS, various obstacles in housing development, such as project delays, cost overruns, and lack of transparency, can be minimized. Ultimately, effective implementation of MIS can contribute to increased productivity in the housing construction process.

3.6 Stakeholders Involved

Stakeholders are individuals or groups who have an interest, influence, or impact on the success of a project or initiative. A stakeholder is defined as any group or individual who can influence or be affected by the achievement of an organization's goals.

In the context of stakeholder theory, companies are considered to have a social responsibility to consider the interests and needs of various related parties and to carry out their business activities ethically and responsibly towards the community and the surrounding environment. By paying attention to and fulfilling the interests of these stakeholders, it is hoped that companies can achieve long-term sustainability and build good relationships with all parties involved (Julythiawati et al., 2023). These stakeholders are parties who will be involved in the information system, where the workflow between each party will flow from and within the information system to one another.

3.7 Information System Designing

Information systems design is the process of designing information systems that suit the needs and goals of an organization. Information system planning includes requirements analysis, system design, implementation, and evaluation. Although it involves four requirements, this research will only cover until the system design. In this research planning, the planning method that will be used is the *Context Data Flow Diagram*.

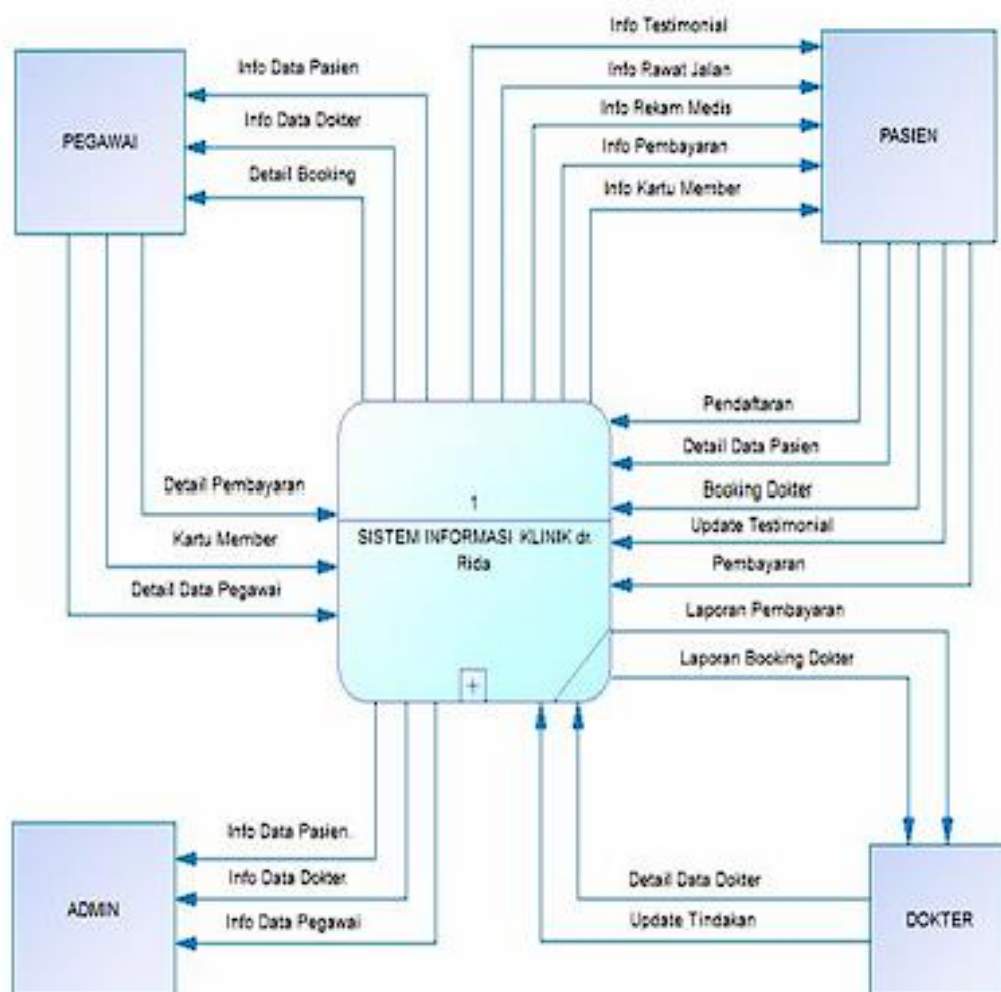
3.7.1 Context Diagram

Context diagrams are tools used to describe information systems in a broader context, including the interactions between the system and external entities. These diagrams provide a clear picture of system boundaries, data flows, and relationships between entities, which are important for understanding the system.

In designing a housing development management information system, context diagrams serve to:

1. **Identify External Entities:** In the context of housing development, external entities can include the Government, Project Owners, Developers, Communities, Suppliers, Financial Institutions, and Insurance Institutions. Each of these entities plays an important role in supporting the development process and must be integrated into the information system.
2. **Show Data Flow:** Context diagrams that describe the data flow between information systems and external entities. For example, an information system can receive input from the community regarding housing needs, and provide output in the form of project progress reports to the government and project owners.
3. **Determine System Boundaries:** By describing the system in a broader context, context diagrams help in defining system boundaries. This is important to ensure that all aspects related to housing development management, including user needs, can be accommodated in the system design.
4. **Facilitate Communication:** Context diagrams serve as an effective communication tool between system developers, stakeholders, and end users. With clear visualization, all parties can better understand the function and purpose of the information system.

In this study, a context diagram will be used to illustrate the relationship between the management information system and various related stakeholders. This aims to show how the information system can contribute to increasing productivity and efficiency in the housing development process, thereby improving the balance between population growth and housing availability. An example of a context diagram can be seen in Figure 3.1 below:



Source: Sutjiadi (2021)

Figure 3.1 Example of Context Diagram

This context diagram is oriented towards data flow with a decomposition concept that can be used to describe system analysis and design that is easy to communicate by system professionals to users and program makers.

3.7.2 Data Flow Diagram

According to Alamsyah (2023), a data flow diagram is a diagram that uses notations to describe the flow of a data system, which is very helpful in understanding the system logically, structured, and clearly. Data flow refers to the flow of information that occurs in an information system, including how data is collected, processed, stored, and distributed. In the context of a housing

development management information system, a deep understanding of data flow is essential to improving productivity and efficiency.

Budi Sutejo Dharma Oetomo (2002) in Alamsyah (2023) mentioned that in the data flow diagram, several things must be considered including:

1. User groups, both internal and external parties of the company and related departments. Where the system will be used must be identified in detail and nothing should be missed.
2. Possible events that will occur in the use of the system must continue to be identified completely.
3. The direction of the arrow indicating the data flow should not be reversed to provide a correct understanding of the entire system process that will be formed.
4. Each event is described in a simple textual form that is easy for the system maker to understand.

Data flow can be depicted using a Data Flow Diagram (DFD), which is a visual tool that depicts the flow of data within a system. DFD identifies external entities that interact with the system, data flow between processes, data storage, and the output produced. DFD consists of several main components, namely:

1. Process: Representation of activities that transform inputs into outputs. Each process in the DFD must have a clear and defined function.
2. Data Store: Where data is stored for future use. This includes databases and files that store important information about the housing project.
3. Data Flow: This shows the direction and type of data that moves between processes, data stores, and external entities. This data flow is important for understanding how information is moved and used within the system.
4. External Entities: Individuals or organizations that interact with the information system. In the context of housing, this could include project owners, developers, contractors, government agencies, and the public.

In this study, the depiction of data flow through DFD is expected to provide a clear picture of how information systems can help in the process of managing housing development projects in a more integrated and efficient manner. By understanding the data flow that occurs, it will be easier to identify points that need improvement, as well as determine solutions to increase construction productivity.

CHAPTER IV

PLANNING METHOD

4.1 General

The research and designing method used in this research is a method of solving the current problem with a solution by planning an Information System. The steps of designing and the research method are explained in detail below.

4.2 Data Obtaining

To obtain data on the current construction process, data collection was carried out directly using the following technique:

1. Observation

This observation was carried out by researching previous research and visiting several stakeholders involved directly to obtain data and matters relating to the required material.

2. Interview

The relevant parties to be interviewed are some stakeholders involved such as Developers, Contractors, and IT experts. This interview was conducted in the form of questions and answers and direct dialogue to find out what the current condition of the organization is like and what the future process should look like to support construction activities.

3. Questionnaire

In this activity, respondents answer questions based on the topic given.

4.3 Planning Method

The planning method in this research consists of several steps, namely: determining and formulating vision goals, identifying stakeholders, analysing current conditions, determining housing models, and planning information systems. All these steps are explained in detail below.

4.4 Determine Vision Goals

The determination of the vision in this study serves as the main guideline in the basic design of the Housing Development Management Information System. The vision to be achieved is the availability of an information system that can increase productivity in the housing development process in Indonesia, especially to overcome the relationship between population growth and housing availability. The objectives of determining this vision are as follows:

1. Aligning all related parties

This vision is designed to ensure that all stakeholders, from the government, developers, and suppliers, to the community, can work in an integrated manner through one efficient and productive platform. With this information system, it is hoped that there will be increased communication, transparency, and coordination between related parties.

2. Optimizing construction productivity

The information system design aims to minimize obstacles in the construction process, such as late delivery of materials, inconsistencies in work schedules, and cost overruns. Through workflow automation and real-time monitoring, construction productivity can be increased.

3. Providing solutions to the imbalance between housing needs and population growth

One of the main problems to be solved is the imbalance between rapid population growth and housing availability. This vision directs this research to create a system that can accelerate the housing planning and development process, with the hope of meeting the demand for housing on a large scale.

4. Supporting sustainable development

In addition to increasing productivity, this information system is also expected to be able to support sustainable housing development, by considering aspects of resource efficiency, time, and cost in the long term.

It is hoped that determining this vision can be the main guide in designing an information system that is right on target and can provide a positive impact on the productivity of housing development in Indonesia.

4.5 Identify Stakeholders

Stakeholder identification is an important step in designing a housing development management information system. Stakeholders are parties who have roles, interests, and influence in every stage of the housing construction process, from planning, and execution, to supervision. In this study, stakeholders were identified based on their interests in the proposed system and the potential impact of the system on housing development productivity.

The stakeholder identification process was carried out through literature studies, interviews with experts in the construction field, and analysis of the roles and responsibilities of each party in the housing project. The results of this identification are used to understand the needs, expectations, and interactions between stakeholders to design an information system that can accommodate their interests and increase construction productivity.

By identifying these stakeholders, this research can guide the development of information systems that can improve the productivity of housing development through better collaboration between stakeholders, more accurate progress monitoring, and more efficient resource management.

4.6 Analysing Current Conditions

At this stage, an analysis of the current conditions related to productivity in the housing development process in Indonesia is carried out. This analysis is important to understand the problems that occur so that appropriate solutions can be formulated in the form of a proposed management information system design. The steps for analysing current conditions include several aspects as follows.

4.6.1 Literature Study

Conducting a review of previous literature and research that discusses population growth and housing needs, current housing construction systems, and

methods. Secondly, obstacles and challenges faced in the housing construction process, such as inefficient communication flows, lack of coordination between stakeholders, and delays in material delivery. Lastly, technology and information systems have been applied in the housing construction sector, both in Indonesia and in other countries.

From the results of this literature review, a general picture will be obtained of the condition of the housing construction sector in Indonesia and how the current system has not been able to achieve optimal productivity.

4.6.2 Interviews and Questionnaires

Primary data collection was conducted through interviews and questionnaires to experts in the construction sector, including project management, developers, and workers in the field, as well as to the community who are the beneficiaries of the housing development process. The questionnaire was designed to identify factors that influence the slowness of the housing construction process, managerial and operational constraints that occur in the field, and how effective the existing information and technology systems are used in the current development process.

The target respondents in this data collection were construction management experts to obtain insight into the project planning and management process, developers assessing the level of efficiency in coordination and decision-making, and the community in measuring the level of satisfaction related to the completion time and quality of housing.

4.6.3 Field Observation

Direct observation of several ongoing housing projects in various locations. The focus of observation includes the effectiveness of the project management process in terms of time, cost, and quality. Also, the workflow between the various parties involved, such as developers, contractors, building material suppliers, and the government. Lastly, the use of technology in project management, such as

project management software, progress reporting, and material and labour monitoring.

4.6.4 Data Analysis

The results of the literature study, interviews, questionnaires, and field observations were then analysed to:

1. Identify the main factors causing the imbalance between population growth and housing availability.
2. Compile a map of problems faced at each stage of construction, from planning, and material provision, to the construction process in the field.
3. Assess the extent to which inefficiencies in housing project management impact overall productivity.

From this analysis, real conditions in the field can be identified which will be the basis for designing a management information system that can increase productivity in housing development.

4.7 Determining Housing Model

Determining the housing model is one of the important stages in the process of designing a management information system to increase the productivity of housing development. The housing model referred to in this study includes the classification of various types and characteristics of housing based on factors that affect development productivity. These factors include land area, building type, material specifications, and the involvement of related parties such as developers, contractors, and suppliers.

At this stage, identification and analysis of housing models commonly applied in Indonesia are carried out, considering demographic data, housing needs, and housing standards set by the government. The research methods used to determine the housing model are as follows:

1. Field Study

Direct field observations were conducted to identify housing conditions in several pilot locations. These observations included analysis of the

environment, building types, and ongoing construction processes. This information will help to develop a model that is more in line with actual conditions in the field.

2. Interviews and Discussions with Construction Experts

To ensure the accuracy of the designed housing model, interviews and discussions were conducted with housing construction experts, including project managers and developers. These interviews will reveal practical insights related to important aspects of construction productivity, such as the use of technology, material management, and project planning.

3. Data Processing and Analysis

The data collected from literature, field studies, and interviews were analysed comprehensively to determine the most appropriate housing model to support the design of the information system. This analysis also includes an evaluation of factors that affect productivity, such as construction time, cost, and building quality.

The housing model obtained from the results of this analysis will be the basis for developing a management information system that can increase efficiency and effectiveness in housing development.

4.8 Information System Designing

This research planning of the information system uses the context and data flow diagram. It is a simple visual representation that depicts how information passes through a system. A system can be anything from an online community to a software application, essentially any collection of items that work together as elements of a larger whole.

These diagrams are useful for stakeholders, managers, and business analysts who want to understand how information flows through a system but are unfamiliar with all its technical aspects. These diagrams assist in identifying external entities connected to the system and demonstrating how they communicate information.

4.8.1 Context Diagram

Context diagrams are used to simplify complicated systems, making them understandable to non-experts while emphasizing the system's breadth and critical interconnections. The steps for creating a context data flow diagram are explained below:

1. Select the Process

Find the central process that defines the system's interactions with external entities. In this case, the process that will be the central of the system is the construction process. It will show how the construction process is managed through an information system.

2. Identify stakeholders

Determine who or what in the system affects its operation, including consumers and other systems. The stakeholders are people or data sources that contribute to the system's functionality. Make a list of these stakeholders and monitor the data flow and processes that are employed. In this case, the stakeholders are the Government, Developers, Project Owners, Financial Institutions or Banks, Suppliers, the Community or Public, Insurance Institutions, Admin, and Housing Development Institutions.

3. Determine data flow

Map the information flow between the process and the stakeholders. This phase helps demonstrate how information passes between the process and stakeholders, illustrating data flow in your context diagram. This case will show how each stakeholder exchanges data with the other through the system.

4. Create the Diagram

Once the process, stakeholders, and data flow have been determined, we can begin creating the context data flow diagram:

- a. Draw a circle in the centre, representing the core process that has been selected.
- b. Surround this circle with rectangles to depict the entities that have been identified.

- c. Use arrows to connect the process and stakeholders, indicating the direction of data flow.
- d. Label these arrows to specify the type of information exchanged.

So, the context diagram focuses more on user interaction with the system and the system workflow.

4.8.2 Data Flow Diagram

Creating a data flow diagram (DFD) involves several steps to visually represent the flow of data within a system. DFD is a continuation of the context diagram. So once the context diagram has been made, here is a step-by-step guide to making DFD:

1. Create Detailed DFDs (Level 1, Level 2, etc.): Break down the high-level process into more detailed subprocesses. Each level provides more detail about the system's processes and data flows.
2. Validate the Diagram: Review the DFD to ensure it accurately represents the system. Check for completeness and correctness.
3. Refine and Iterate: Make necessary adjustments based on feedback and further analysis. DFDs are often refined multiple times to ensure accuracy.

4.9 Overall Method

The following flowchart shows the overall process and stages of the final project research.

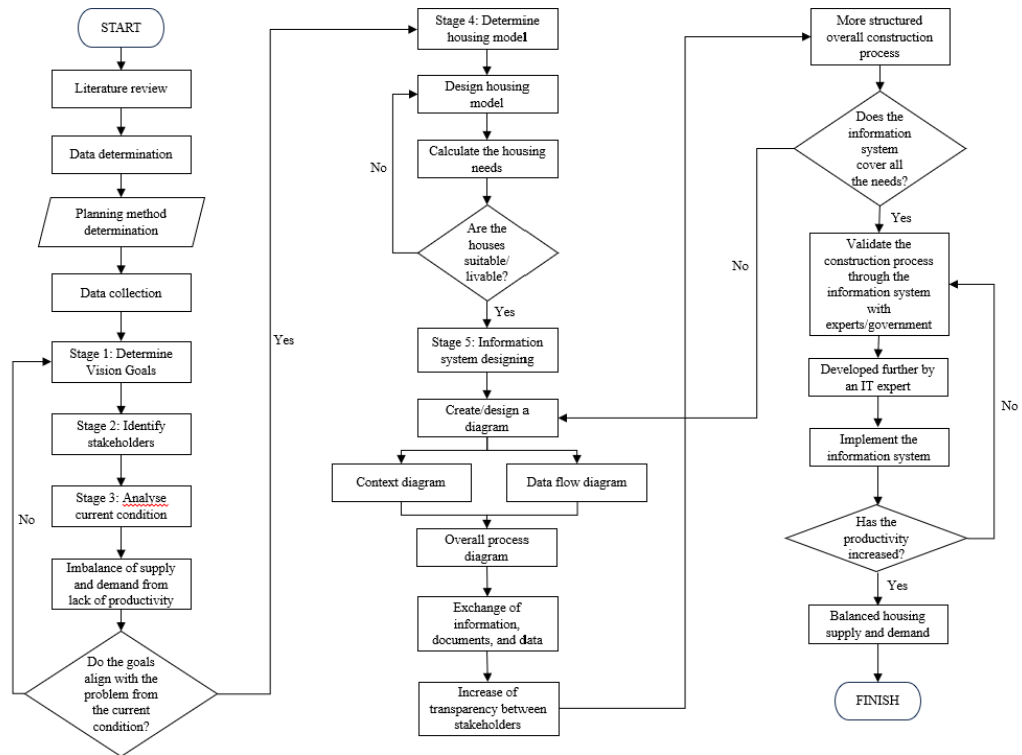


Figure 4.1 Flowchart of Final Project Research

Meanwhile, the following flowchart shows the design process of the information system using the context diagram and data flow diagram.

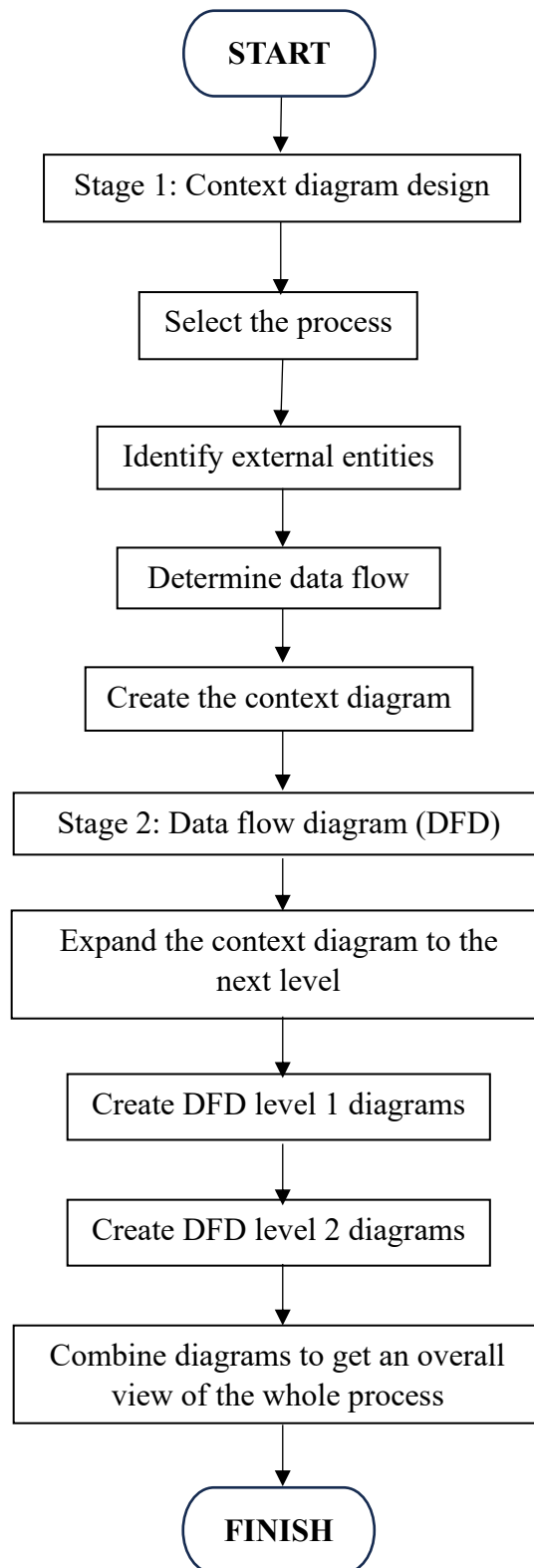


Figure 4.2 Flowchart of Diagram Designing Process

CHAPTER V

RESULT AND DISCUSSION

5.1 Vision Goals

This goal and vision will be a guide in developing an information system that is not only effective but also relevant to the needs of the housing construction industry in Indonesia. The vision of the designed information system is to realize a more efficient, transparent, and integrated housing construction process to overcome the gap between population growth and availability. Therefore, this vision focuses on increasing the productivity and efficiency of the construction process using appropriate information technology. Based on the observation and interviews that have been done with several stakeholders that will be involved, the main objectives of designing this information system are:

1. Increase productivity in the housing development process through optimization of data and information management.
2. Realize a more integrated flow of information between various stakeholders, including the government, developers, material providers, and the public.
3. Minimize time and costs in the planning, implementation, and supervision of housing construction projects.
4. Improve data transparency and accuracy by providing easier and faster access to project-related information, such as construction status, material needs, and financing.
5. Reduce the risk of delays and inefficiencies in the construction process by monitoring schedules and resource usage in real time.
6. Support the formulation of more appropriate policies by the government to overcome the housing crisis through accurate and structured data.

This vision and goal are the main foundations in designing an information system, where it is expected that each element in the system will be able to work in a coordinated manner to achieve optimal efficiency. With an integrated and easy-

to-use information system, it is expected that the housing construction process will experience a significant increase in productivity so that it can keep up with the increasing population growth rate.

5.2 Stakeholders Involved

In the housing development process, various stakeholders have important roles that are interrelated with each other. A management information system designed to improve productivity must consider the needs and interactions of each stakeholder involved. Stakeholders in housing development identified in this study include:

1. Government

The government acts as a regulator that sets policies and regulations related to housing development. The government also plays a role in supervision and provides incentives in the development process to ensure the availability of decent housing for the community.

2. Project Owner

The project owner, either an individual or an organization, is the party responsible for the development and funding of the housing development project. They have an interest in ensuring that the project runs according to plan and budget.

3. Developer

The developer acts as the party that manages all development activities, from planning, and procurement of raw materials, to implementation of construction. They play an important role in ensuring efficiency and productivity in the development process.

4. Community (Consumers/Residents)

The community is the beneficiary of the housing project, both as consumers and as residents of the house. They have an interest in getting housing that meets their needs and quality standards.

5. Supplier

The supplier provides the materials and materials needed in the construction process. The role of the supplier in this information system is very crucial, especially in terms of inventory management, delivery times, and the quality of materials used in construction.

6. Financial and Banking Institutions

Financial and banking institutions play a role in providing funding sources for project owners and developers, either in the form of loans, credit, or other financing schemes. They play a role in facilitating the flow of funds needed for the sustainability of the project.

7. Insurance Institutions

They play a role in protecting against risks associated with construction, such as material damage, work accidents, and other risks that can affect the sustainability of the project.

8. Information System Admin

The admin is the party responsible for managing and maintaining the management information system. They ensure that the system runs well, data is managed accurately, and stakeholders can access the necessary information promptly.

9. Housing Legislation Institution

This institution plays a role in supervising and enforcing regulations related to housing construction, especially those related to building quality, safety, and feasibility standards.

10. Earthquake Expert

Earthquake experts play a role in ensuring that housing design and construction meet safety standards appropriate to the seismic conditions of the area. They help identify potential earthquake risks and provide input into designing structures resistant to seismic vibrations, reducing the risk of damage and building loss due to earthquakes.

The identification of stakeholders aims to understand the needs and roles of each party in the information system to be designed. Each stakeholder has a significant influence on the productivity of housing development, so the proposed information system must be able to accommodate interaction and coordination between these stakeholders.

5.3 Current Condition

Currently, Indonesia faces significant challenges in providing housing that is balanced with rapid population growth. High urbanization rates have narrowed the gap between housing needs and the availability of decent housing. According to data from the Central Statistics Agency (BPS), there is a significant gap between the number of houses needed and those successfully built each year. This limitation is largely due to inefficient construction processes.

Based on the interviews that have been done with various stakeholders involved, factors that influence this unproductivity include:

1. Weak Coordination Between Stakeholders

Communication and coordination between the government, developers, contractors, and other related parties often run less than optimally. The multi-level and complicated decision-making process adds to the slowness of development.

2. Limitations of Integrated Information Systems

Currently, most processes in housing development projects are still carried out manually or with separate systems. The absence of an integrated information system makes project data difficult to access and analyse by all stakeholders, thus slowing down decision-making and monitoring.

3. Suboptimal Resource Management

The distribution of construction materials, human resources, and budget management are often not managed properly. This causes project delays and unnecessary cost increases.

4. Lack of Utilization of Technology in the Construction Process

Although technology in construction has developed rapidly, its implementation in housing development projects in Indonesia is still very limited. Most developers and contractors still rely on traditional methods, which reduce productivity.

In this condition, the development of a Construction Management Information System is a much-needed solution to solve the problem of unproductivity. This system is expected to facilitate data integration, improve coordination between parties, and provide real-time analysis in every stage of the construction project. With an integrated information system, decision making can be done faster and more accurately, which is ultimately expected to increase productivity in housing construction.

5.4 Housing Model

The housing model in Indonesia is generally based on several key factors, such as the community's need for housing, government regulations, developer capacity, and the availability of construction resources. Amid the increasing need for housing caused by rapid population growth, there is a continuity between demand and supply, which ultimately slows down the process of providing housing.

A housing model is a form of housing used as a standard for planning. To determine the housing model for society's needs, we must consider several things, such as the average housing needs with the growing population, how many Subdivisions and Villages are in Sleman, and the standard size of housing.

The housing model is calculated based on the distribution of national needs per location as seen in Table 5.1 and Table 5.2.

Table 5.1 Description of Regions in Indonesia

Region	Total
Province	38
Regency	416
Subdistrict	7.266
Village	83.381

Source: (Badan Pusat Statistik Indonesia, 2024)

Table 5.2 Descriptions of Regions in Yogyakarta

Regions	Total
Regency	5
Subdistrict	78
Village	438

Source: (Badan Pusat Statistik Indonesia, 2024)

According to Badan Pusat Statistik Indonesia (2024), Indonesia's population has reached 281,603,800 people. The average demand for housing in Indonesia stands at 2,917,108 houses. Take the city of Yogyakarta for example, with a population of 4,126,444 people. The calculation of how many houses the city of Yogyakarta needs to supply is shown below:

$$\text{Yogya housing demand} = \frac{\text{Yogyakarta's population}}{\text{Indonesia's population}} \times \text{Avg housing demand in Indonesia}$$

$$\text{Yogya housing demand} = \frac{4,126,444}{281,603,800} \times 2,917,108$$

$$\text{Yogya housing demand} = 42,745 \text{ houses}$$

This target is challenging, as the highest annual production of houses was only 21,076 in 2022 (Capaian Program Sejuta Rumah, 2023). Of those 42,745 houses, 75% (32,058 houses) are MBR and 25% (10,686 houses) are non-MBR. After interviewing several Developers, as an assumption, the housing design for both MBR and non-MBR in each location are shown below.

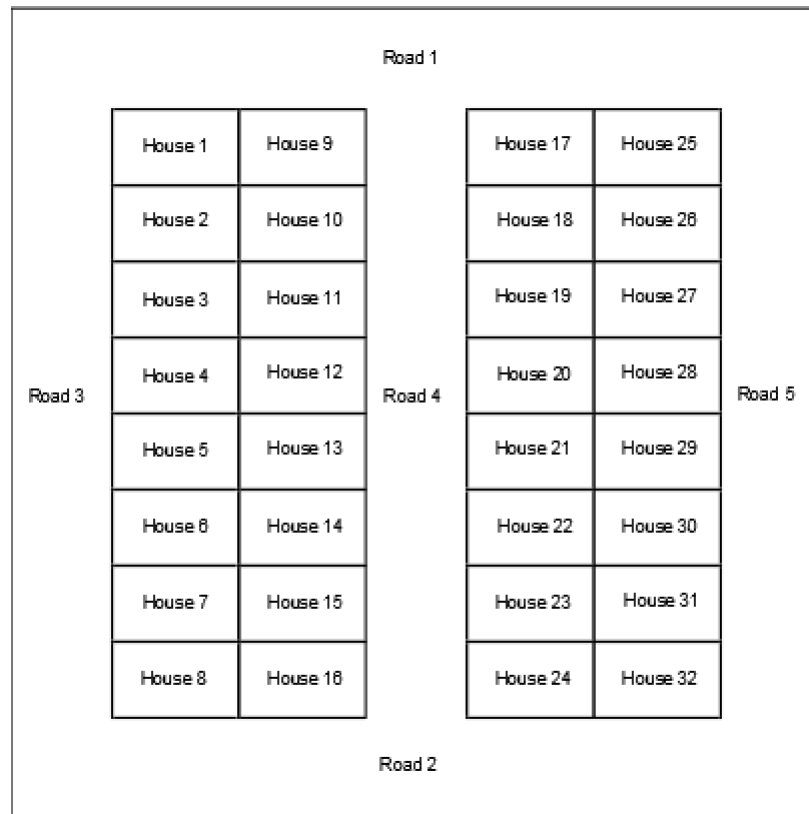


Figure 5.1 Site Plan of the MBR Housing Model for Each Location

Based on Figure 5.1, there are 20 houses per location. To determine how many locations are needed to build those types of housing plans, the calculation will be shown below:

$$\text{Total locations} = \frac{\text{Yogya housing demand(MBR)}}{\text{Total houses per location}}$$

$$\text{Total locations} = \frac{32,058}{32}$$

$$\text{Total locations} = 1,002 \text{ locations}$$

With having to build 32,058 MBR houses in 1,002 locations, the productivity of housing construction needs to be improved. The detailed information and measurements for each house will be shown below.

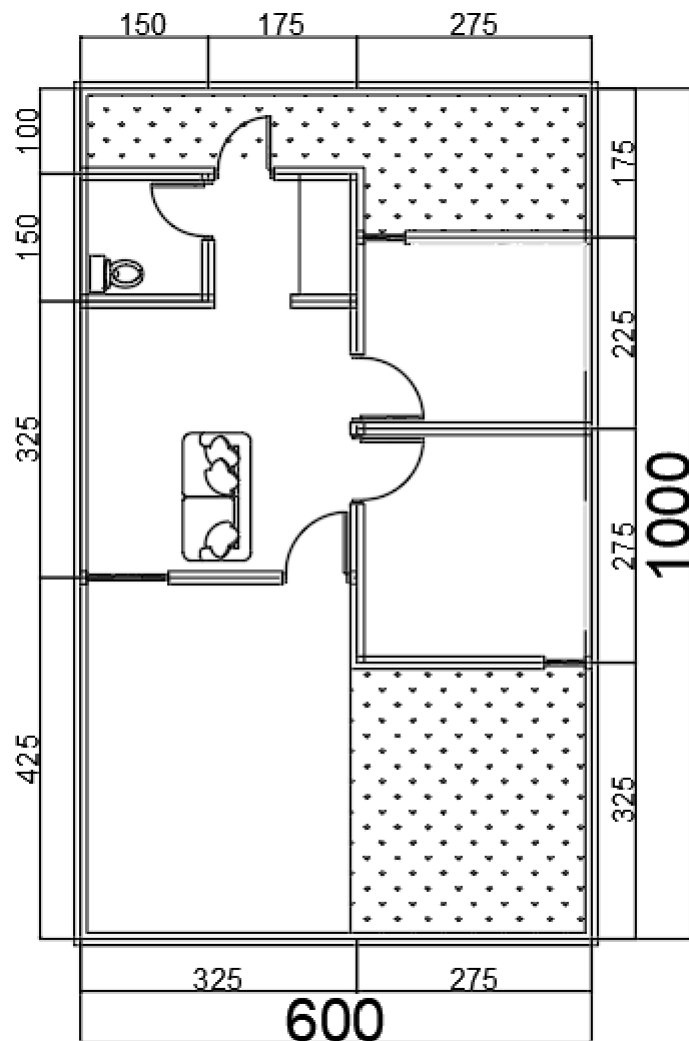


Figure 5.2 Detailed Information for Each MBR House

The design of house plan for non- MBR houses are shown below.

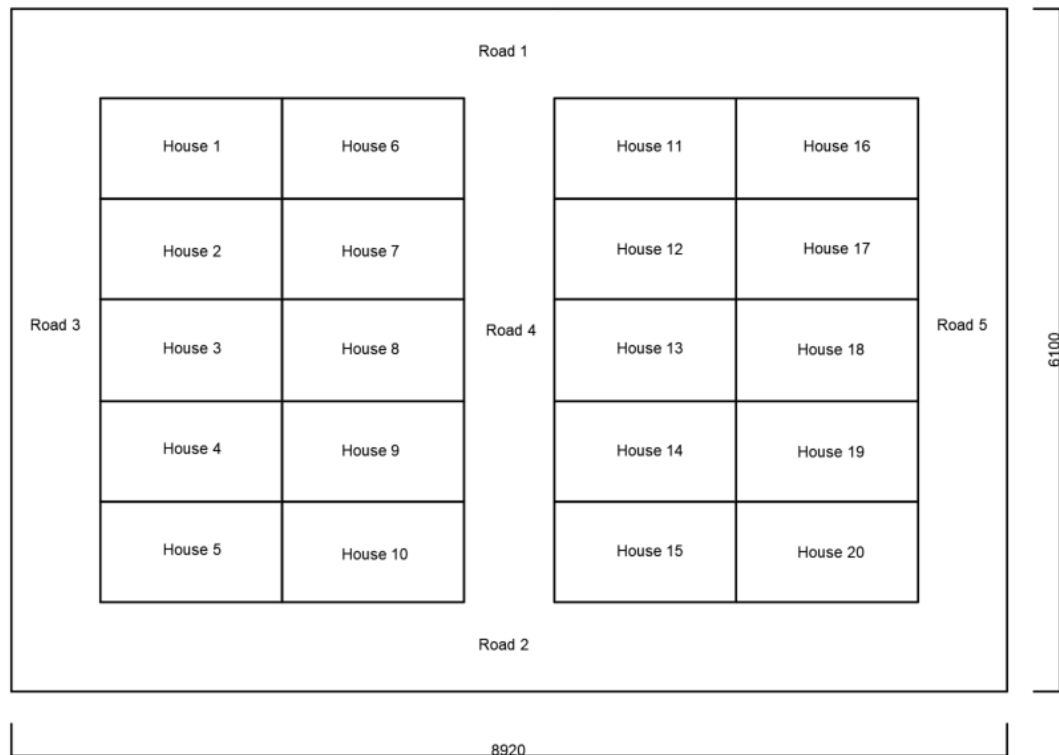


Figure 5.3 Site Plan of the Non-MBR Housing Model for Each Location

Based on Figure 5.3, there are 20 houses per location. To determine how many locations are needed to build those types of housing plans, the calculation will be shown below:

$$\text{Total locations} = \frac{\text{Yogya housing demand}}{\text{Total houses per location}}$$

$$\text{Total locations} = \frac{10,686}{20}$$

$$\text{Total locations} = 534 \text{ locations}$$

With having to build 10,686 houses in 534 locations, the productivity of housing construction needs to be improved. The detailed information and measurements for each house will be shown below in Figure 5.4.

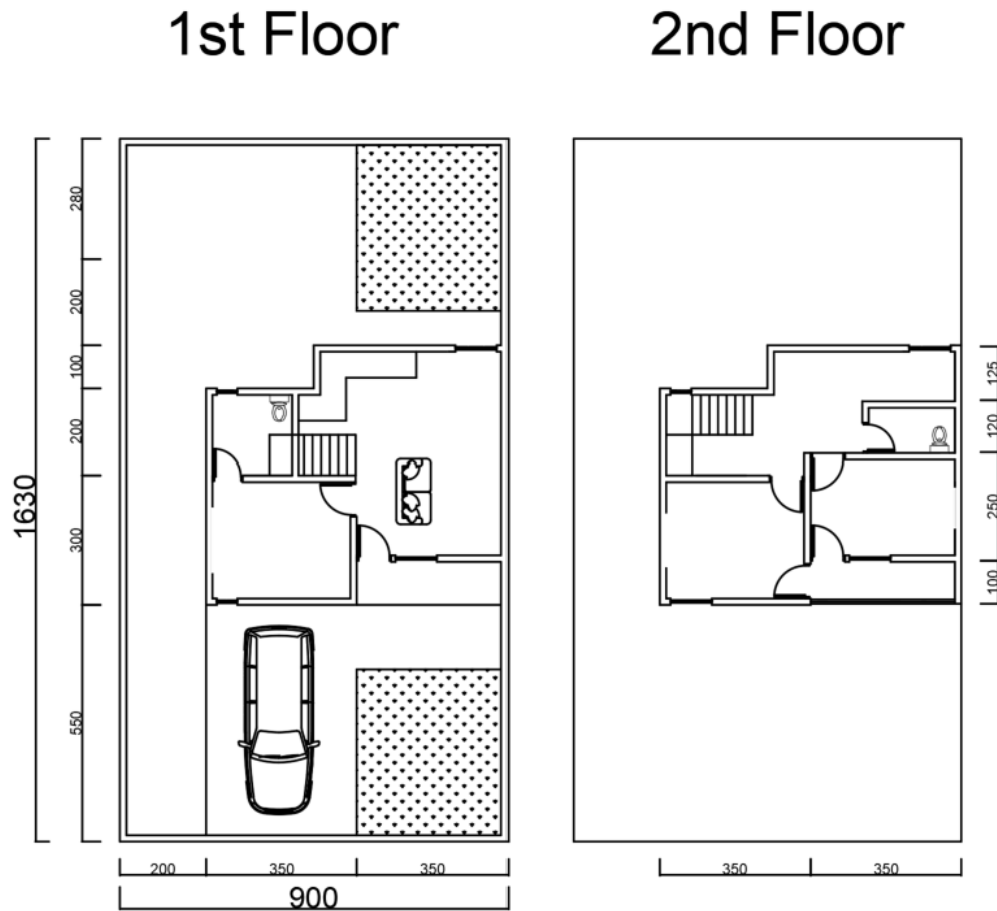


Figure 5.4 Detailed Information for Each Non-MBR House

The Figures above are an example of an illustration of the design of each house. Here is an explanation for the design above:

1. Road Layout (Road 1, Road 2, Road 3, Road 4, Road 5)

Road layout design connecting various blocks of houses or buildings. Road planning must consider transportation efficiency, accessibility, and traffic safety aspects. The image shows a road surrounding the building allowing access to the surrounding houses.

2. House or Block Numbering

Each house or building unit is numbered for easy identification and orientation. This is an important part of residential area planning, ensuring that each unit

has clear access to the road and is easily identifiable for logistics, public services, or emergencies.

3. Land Use Efficiency

This layout design shows efficient land use, with areas separated in an organized manner between building units and green spaces. This arrangement considers space optimization, good drainage, and stormwater management to avoid flooding.

The housing design shown in the figures above is based on assumption because how many houses can be built will depend on how big the available land is. Therefore, each location might have a different number of houses built and each location might have slightly different sizes of design. The housing model produced by this system is expected to create a more efficient workflow, increase productivity in every stage of development, and ultimately be able to meet the increasing housing needs more quickly and on target.

5.5 Information Systems Features

The information system designed in this study aims to increase productivity in the housing construction process by facilitating data integration and communication between stakeholders. The features that will be in the information system need to be developed as an information system strategy plan for the construction process. Based on the needs analysis and system design and the results from interviewing several developers and contractors, some of the main features designed for this system can be seen in Table 5.3.

Table 5.3 Information System Features

No	Features	Description
1	Project Management	This feature serves to assist in overall project management, from planning, and implementation, to project completion. Through this feature, every stage of housing development can be monitored in a real-time by all parties involved, including developers,

Continued Table 5.3 Information System Features

		project owners, and the government. The recorded data includes project schedules, resource allocations, and project targets and achievements.
2	Resource Management	This system provides features for resource management such as labour, materials, and construction tools. Every use of resources will be recorded and monitored, making it easier to make decisions regarding more efficient resource allocation. This is expected to reduce waste and increase productivity in the construction process.
3	Location Mapping and Land Availability	This feature serves to provide information related to the location of land available for housing development. The information presented includes land status, land owners, and potential land use according to government regulations. With this feature, developers can easily find suitable land for new housing projects.
4	Financial Management and Financing	This system provides features for recording and managing the financial aspects of a project, including budget, expenditure, and income. In addition, there is integration with financial institutions or banks to facilitate project financing, such as construction loans or home loans for consumers. This feature also allows for transparent cash flow tracking between the parties involved.
5	Project Monitoring and Evaluation	This feature is designed to monitor and evaluate project performance continuously. Through data generated by the system,

Continued Table 5.3 Information System Features

		project owners and developers can evaluate performance from various aspects, such as project completion time, resource usage, and costs incurred. This feature also provides automatic reports that can be accessed by all relevant stakeholders.
6	Communication and Collaboration Systems	To support better coordination between stakeholders, the system provides a communication feature that allows direct interaction between parties involved in the project. Automatic notifications and reminders will be sent regarding tasks or milestones that need to be completed, thus minimizing delays due to lack of coordination.
7	Integration with Government Systems and Regulations	This system is designed to integrate with government regulations and policies related to housing development. Data on licensing requirements, building standards, and policies related to sustainable development will be automatically updated in the system, so developers can easily comply with applicable regulations without having to do manual checks.
8	Reporting and Data Analysis	A reporting feature that can generate detailed reports on project performance, budget usage, and productivity levels. In addition, the data analysis feature allows users to evaluate the effectiveness of the construction process and identify areas that need improvement. This reporting can be transparently accessed by all stakeholders.

5.6 Information Systems Results

The strategic planning for information system implementation is prepared based on the parties involved and their roles in the information system. Each of the results such as the stakeholder's main functions has been mentioned in the subchapter above and the information system diagram will be explained and shown in detail below.

Based on each stakeholder's main functions that have been explained above, the implementation of the information system's basic design and the flow of the information system is being built in the form of a *Context Diagram and Data Flow Diagram*.

5.7 Context Diagram

This diagram illustrates the interaction between the designed information system and external entities related to it. This study's Context Diagram provides an overview of the main data flow between the Housing Development Management Information System and the stakeholders involved.

The main data flows shown in the context diagram include exchanging information related to project plans, progress reports, material submissions, fund management, and end-user data. This diagram shows that the designed system will manage and process data from various external entities to improve efficiency and productivity in the housing development process.

After observation and interviewing several IT experts, the simple form of a context diagram that depicts the main flow of data between the system and stakeholders is shown in Figure 5.5 below.

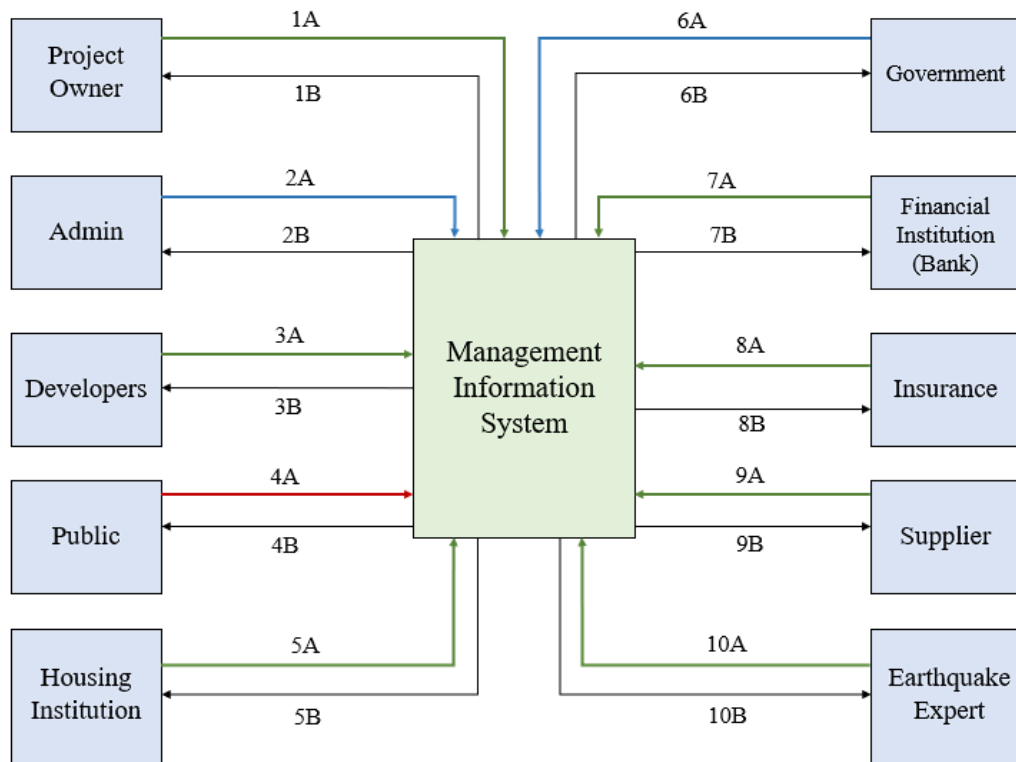


Figure 5.5 Context Diagram for Future Construction Process

As can be seen in Figure 5.5, there are different-coloured arrows. Each description of an arrow will be explained in Table 5.4 below.

Table 5.4 Description of Accesses

No	Arrow	Description
1		Blue arrows mean the stakeholder has all access to the information system, including access to the data of each stakeholder involved. This means they can view and change any data from any stakeholder.
2		Green arrows mean the stakeholder has access to only their part in the information system. This means they can only view and change data from the work related to them.
3		The red arrow means that the stakeholder only has access to what is given as public view access. This means that they cannot change any information given, but they can only give feedback or insights.

Based on Figure 5.5, each stakeholder plays an important role in the information system. Each stakeholder can receive and give information by exchanging data. Details of each information sought and obtained will be explained below.

Table 5.5 Exchange of Information in The Information System

No	Stakeholder	Information
1	Project Owner	() Access to only project information such as project documents, project updates, project schedules, project budget, etc.
		1A (Give) <ul style="list-style-type: none"> - Project financing details and budget allocations. - Project goals, timelines, and scope. - Decision approvals on designs,

Continued Table 5.5 Exchange of Information in The Information System

		contractors, and timelines.
		1B (Receive) <ul style="list-style-type: none"> - Real-time project status updates (progress, costs, timelines). - Reports on resource usage, construction milestones, and overall compliance. - Financial performance reports. - Risk assessment and alerts related to project challenges or delays.
2	Admin	(→) All data can be accessed such as personal data from each stakeholder, all project data, the system data, etc.
		2A (Give) <ul style="list-style-type: none"> - System configuration and access rights for stakeholders. - Collected project data for analysis and reporting. - IT support for the system's maintenance and upgrades.
		2B (Receive) <ul style="list-style-type: none"> - Data from all stakeholders for analysis and report generation. - Feedback on system performance and required adjustments. - Requests for system updates or additional features.
3	Developer	(→) Access to only project information such as project designs, project documents, project updates, project schedules, project budget, etc.

Continued Table 5.5 Exchange of Information in The Information System

		<p>3A (Give)</p> <ul style="list-style-type: none"> - Project plans, designs, and construction schedules. - Resource requests (materials, labour, and equipment). - Construction progress updates and milestones. - Marketing and sales data for housing units.
		<p>3B (Receive)</p> <ul style="list-style-type: none"> - Material availability and delivery timelines from suppliers. - Financial status updates from banks and project owners. - Feedback and requirements from project owners and government. - Permit and approval statuses from the government.
		<p>(→) Access to only public information viewing news or updates about construction. Also only able to give feedback and insights.</p>
4	Public	<p>4A (Give)</p> <ul style="list-style-type: none"> - Feedback on housing needs, preferences, and community concerns. - Participation in surveys, public hearings, or consultations. - Reports of issues or suggestions for improvements in housing projects.
		<p>4B (Receive)</p> <ul style="list-style-type: none"> - Information about available housing units and construction timelines.

Continued Table 5.5 Exchange of Information in The Information System

		<ul style="list-style-type: none"> - Project updates and public engagement opportunities. - Access to public forums and hearings about housing projects. - Reports on the development's impact on the local community.
5	Housing Legislative/Institution	(→) Access to only data/information related to housing construction, housing requirements, housing recommendations, etc.
		5A (Give) <ul style="list-style-type: none"> - Legal guidelines, housing standards, and regulations. - Information on professional permits and required certifications. - Feedback or recommendations for policy improvements.
		5B (Receive) <ul style="list-style-type: none"> - Compliance reports from project owners and developers. - Data on legal disputes, challenges, and regulatory breaches. - Project documentation to ensure adherence to current laws. - Feedback on necessary regulatory changes or enhancements.
6	Government	(→) All data can be accessed such as personal data from each stakeholder, all project data, the system data, etc. Able to change requirements for construction.

Continued Table 5.5 Exchange of Information in The Information System

		<p>6A (Give)</p> <ul style="list-style-type: none"> - National and local building codes, safety standards, and zoning regulations. - Permit approvals, environmental guidelines, and housing policies. - Funding incentives and support for affordable housing projects.
		<p>6B (Receive)</p> <ul style="list-style-type: none"> - Project compliance reports from developers and owners. - Data on resource usage, timelines, and construction quality. - Feedback from the public on housing needs and community impact. - Reports on project progress and milestones for regulatory oversight.
7	Financial Institution (Bank)	<p>(→) Access to only data/information related to project financials, project budgeting, loans, stakeholders' financial status, etc.</p>
		<p>7A (Give)</p> <ul style="list-style-type: none"> - Loan applications, mortgage approvals, and credit line offers. - Interest rates, payment terms, and financial products. - Financial risk assessments for the project and stakeholders.
		<p>7B (Receive)</p> <ul style="list-style-type: none"> - Financial status updates from project owners and developers. - Payment schedules and fund allocation reports.

Continued Table 5.5 Exchange of Information in The Information System

		<ul style="list-style-type: none"> - Construction progress reports to assess project viability. - Data on loan repayment and customer creditworthiness.
8	Insurance Institution	<p>(→) Access to only data/information related to project financials, project budgeting, loans, stakeholders' financial status, etc.</p> <p>8A (Give)</p> <ul style="list-style-type: none"> - Insurance policy details for construction risks (damage, delays, accidents). - Claims processing and management information. - Risk coverage options and terms for stakeholders. <p>8B (Receive)</p> <ul style="list-style-type: none"> - Reports on construction risks and potential hazards from developers. - Claims data from accidents, project interruptions, or failures. - Data on project timelines, milestones, and incidents. - Feedback on insurance policy requirements and modifications.
9	Suppliers	<p>(→) Access to only data/information related to project materials, materials price, materials quality, materials stocks, material needs, etc.</p> <p>9A (Give)</p> <ul style="list-style-type: none"> - Material availability, pricing, and specifications.

Continued Table 5.5 Exchange of Information in The Information System

		<ul style="list-style-type: none"> - Delivery schedules and shipment tracking. - Invoice and payment details for ordered materials.
		<p>9B (Receive)</p> <ul style="list-style-type: none"> - Material demand forecasts and requests from developers. - Project timelines to align material delivery with construction phases. - Payment confirmations from financial institutions or project owners. - Feedback on material quality and timeliness from developers.
10	Earthquake Experts	<p>(→) Access to only data/information related to project structure requirements, project structure recommendations, project structure designs, etc.</p>
		<p>10A (Give)</p> <ul style="list-style-type: none"> - Seismic risk assessments for construction sites. - Guidelines on earthquake-resistant construction techniques. - Reports on seismic activity and recommendations for structural improvements.
		<p>10B (Receive)</p> <ul style="list-style-type: none"> - Construction plans, designs, and updates to assess earthquake resilience. - Compliance data related to seismic building codes. - Project milestones updates for inspection

From the diagram above, the Housing Development Management Information System acts as the centre of information flow. Each external entity is connected to the system through a specific data flow, such as project report data from developers or credit application data from the community. The data generated by each entity will be processed by the system to provide feedback that can be accessed by related entities, to accelerate the decision-making process, resource management, and project coordination. Each stakeholder's involvement with the system also guarantees that information flows smoothly, facilitating decision-making and increasing productivity in house construction projects.

This Context Diagram is the initial basis for further modelling which will be explained in the Data Flow Diagram (DFD) section which describes more detailed data flow details within the system.

5.8 Data Flow Diagram

The Housing Development Management Information System aims to increase the productivity of the housing construction process by integrating various data flows involving various stakeholders. This section explains the design of the Data Flow Diagram (DFD) Level 1 and Level 2 which describe the data flow between entities and processes involved in the system.

5.8.1 Data Flow Diagram Level 1

At Level 1, DFD describes the general processes in this information system. At this stage, the stakeholders involved interact with the system in the form of predetermined inputs and outputs. In DFD Level 1, we will further detail the data flow that occurs in the system for each process that occurs in DFD Level 0. This describes the internal processes in the information system and more detailed interactions with stakeholders. The main processes that will be detailed in DFD Level 1 are Project Data Management, Financing and Payment Management, Material and Construction Material Management, Insurance Management and Project Protection, Technical Verification (Earthquake Expert), and Provision of Project Reports.

1. Project Data Management:

- a. The project owner provides the project plan and specifications, then the system will store and process the data.
- b. The developer also provides input for the project plan and budget, which is then verified by the system.
- c. The government verifies the project's compliance with regulations and provides feedback.

The visualization of the project data management can be seen in Figure 5.6 below.

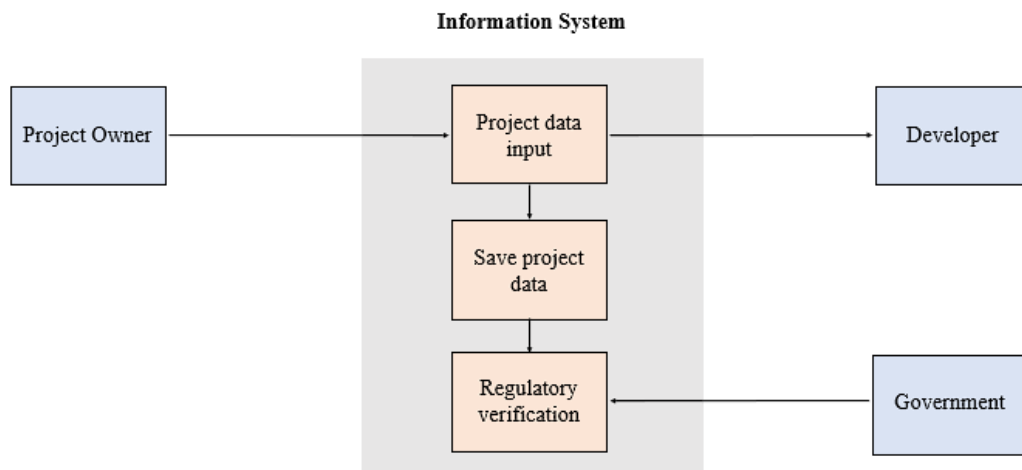


Figure 5.6 DFD Level 1 of Project Data Management

2. Financing and Payment Management:

- a. The bank processes loan applications from the public.
- b. The SI system manages the payment flow from the developer to the project owner and from the public to the bank.
- c. The bank also provides payment status and information.

The visualization of the financing and payment management can be seen in Figure 5.7 below.

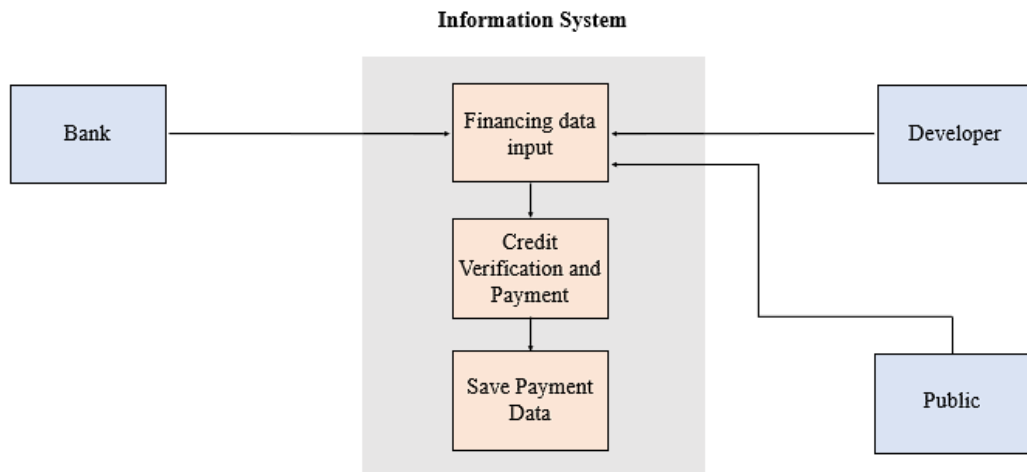


Figure 5.7 DFD Level 1 of Financing and Payment Management

3. Material Management and Construction Materials:

- a. Developers submit material requests through the system.
- b. The IS system connects suppliers to provide construction materials.
- c. The system also records material stock and project requirements.

The visualization of the material management and construction materials can be seen in Figure 5.8 below.

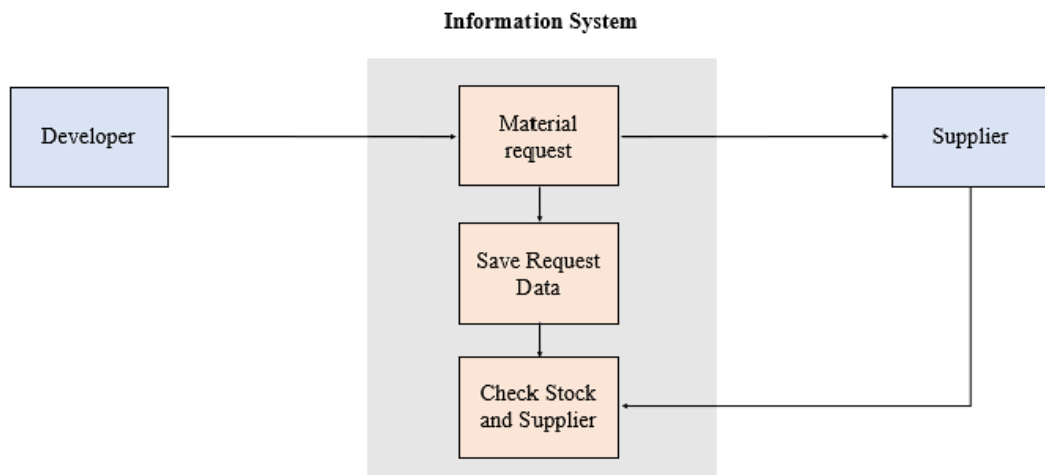


Figure 5.8 DFD Level 1 of Material Management and Construction Materials

4. Insurance Management and Project Protection:

- a. Insurance institutions provide data related to policies and project protection.
- b. The system manages insurance data and records claims.

The visualization of the insurance management and project protection can be seen in Figure 5.9 below.

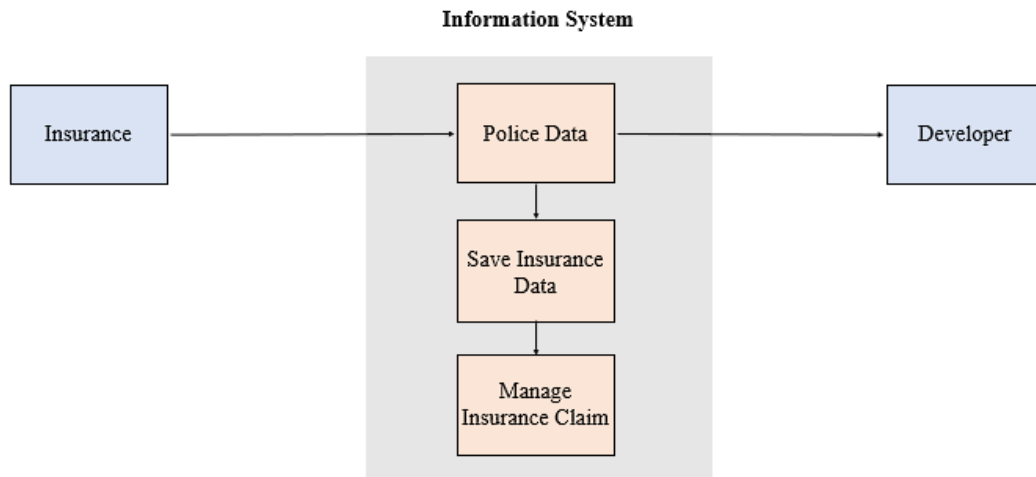


Figure 5.9 DFD Level 1 of Insurance Management and Project Protection

5. Technical Verification (Earthquake Expert):

- a. Earthquake experts provide recommendations and verify construction safety standards.
- b. The system records the verification and provides feedback to the developer and project owner.

The visualization of the technical verification can be seen in Figure 5.10 below.

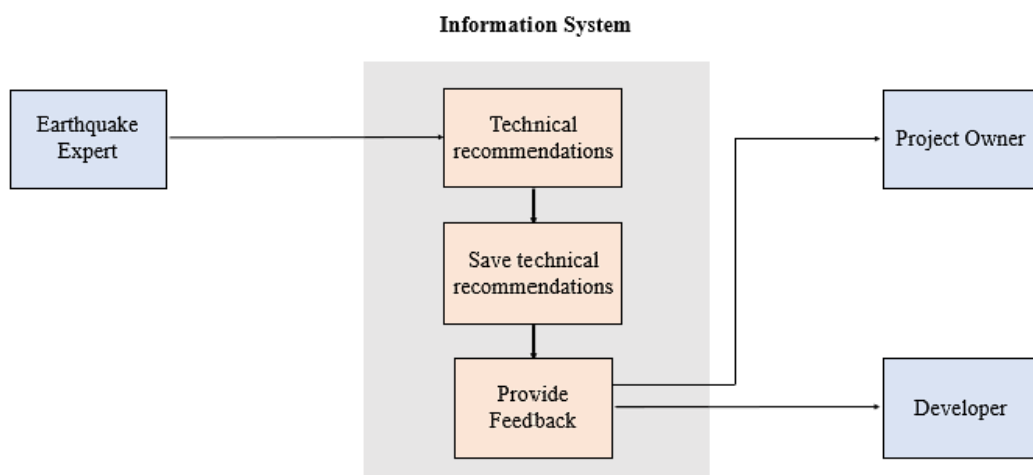


Figure 5.10 DFD Level 1 of Technical Verification

6. Project Report Provision:

- a. Project owners, developers, and governments can request project progress reports.
- b. The system provides appropriate reports based on stored data.

The visualization of the project report provision can be seen in Figure 5.11 below.

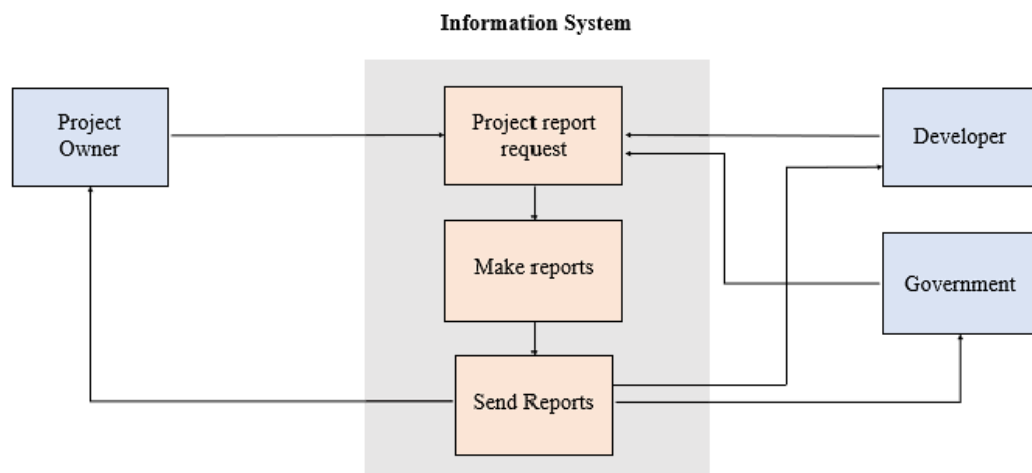


Figure 5.11 DFD Level 1 of Project Report Provision

Each process within the system is further detailed by showing how data is entered, processed, and delivered to relevant stakeholders. Data flows become more specific, outlining the internal processes within the information system that increase the productivity of housing development.

5.8.2 Data Flow Diagram Level 2

DFD Level 2 will detail each process from DFD Level 1 into more detailed sub-processes. Here, we will divide the big processes from DFD Level 1 into smaller parts, making it easier to understand the data flow and interactions in the housing development management information system.

1. Project Data Management

Sub-Process 1: Project Plan Input

- a. Project Owner provides initial project planning information.
- b. Developer enters specific data related to project development.

Sub-Process 2: Plan Verification and Approval

- a. Government verifies and gives approval or advice on projects.
- b. Housing Agency ensures projects comply with housing regulations.

Sub-Process 3: Save Project Data

- a. Admin saves all project data in the system.
- b. Developer data is updated periodically during the project.

Sub-Process 4: Project Report Provision

- a. Project Owner receives project progress report.
- b. Government receives reports for monitoring purposes.
- c. Bank receives the report for a project financing application.

Sub-Process 5: Technical Readiness Assessment (Earthquake Expert)

- a. Earthquake Expert provides technical input on project readiness in terms of seismicity and safety.

Sub-Process 6: Material Procurement Coordination (Supplier)

- a. Supplier receives a material request from developer and supplies material.
- b. Developer sends the material request.

The illustration of the diagram for project data management can be seen in Figure 5.12 below.

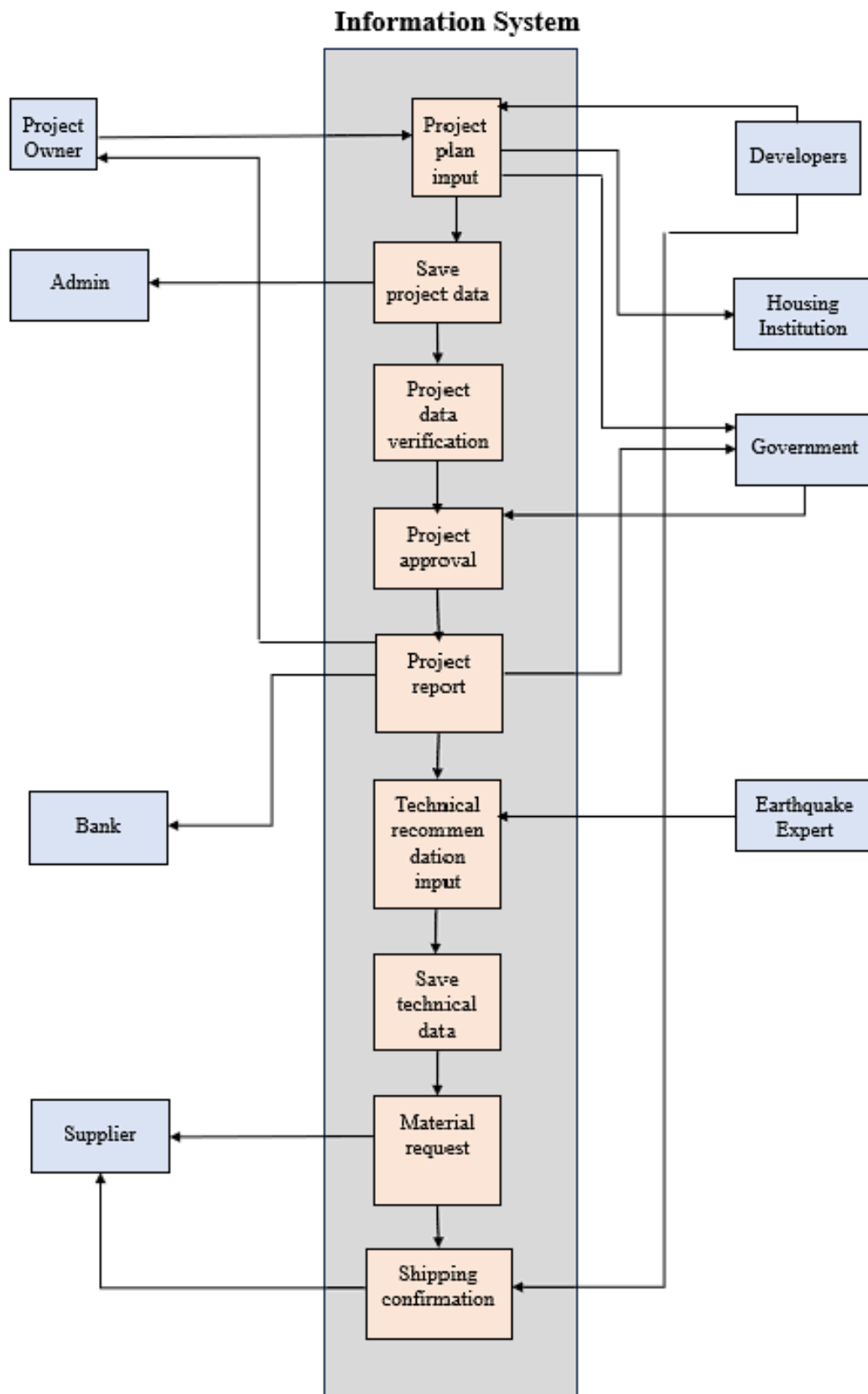


Figure 5.12 DFD Level 2 of Project Data Management

2. Financing and Payment Management

Sub-Process 1: Input Financing Data

- a. The community or developer submits a financing application to the IS System.
- b. The SI System processes and stores financing data.

Sub-Process 2: Financing Verification

- a. The Bank or Insurance Institution receives the financing application for verification.
- b. If the verification is successful, the data is forwarded to the IS System for further processing.

Sub-Process 3: Save Financing Data

- a. The IS system stores financing data that the bank or related institution has verified.

Sub-Process 4: Payment Submission

- a. Developer submits payment to Project Owner and Bank through IS System.

Sub-Process 5: Payment Verification

- a. The Project Owner and Bank verify the payment submitted by the Developer.
- b. After verification, the payment is processed.

Sub-Process 6: Payment Process

- a. The Bank processes payments from the Project Owner to Suppliers and Developers.

Sub-Process 7: Send Payment Notification

- a. The SI system sends payment notifications to the community, developers, and suppliers, letting them know the payment has been successfully processed.

Sub-Process 8: Save Payment Data

- a. The IS system saves all data related to successfully processed payments.

The illustration of the diagram for financing and payment management can be seen in Figure 5.13 below.

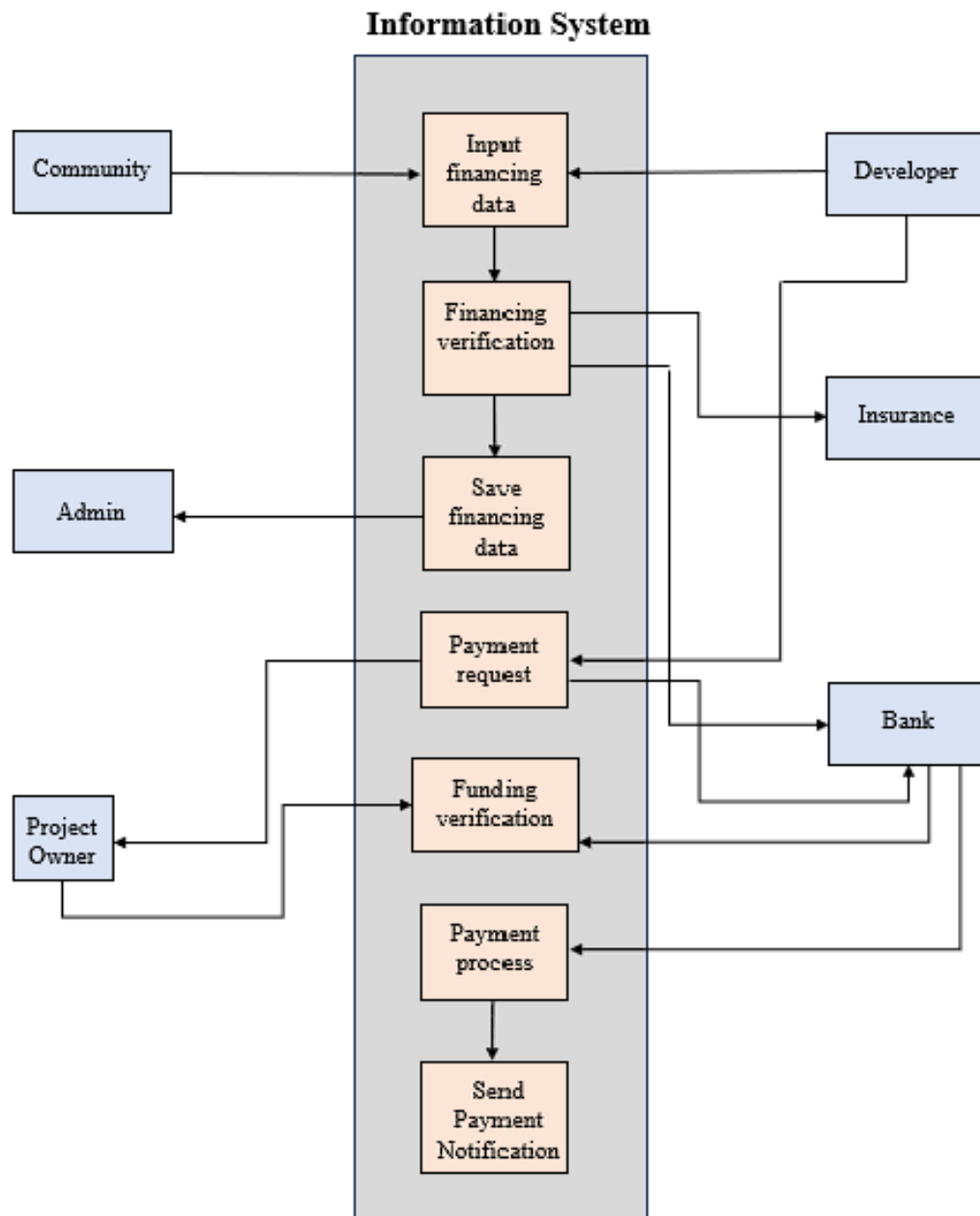


Figure 5.13 DFD Level 2 of Financing and Payment Management

3. Material Management and Construction Materials

Sub-Process 1: Material Request

- a. Developers input material requests into the information system.

Sub-Process 2: Material Data

- b. Check Material Stock in the system.
- c. Send Request Data to Supplier if stock is insufficient.

Sub-Process 3: Material checking

- a. Material Quality Verification by Government.
- b. Delivery of Materials by Supplier.

Sub-Process 4: Material Payment and Verification

- a. Material Payment by Developer through Bank.
- b. Material Verification by Government and Housing Institution.

Sub-Process 5: Material Update

- a. Save Request and Delivery Data by SI Admin.
- b. Storage and Tracking of Materials in the field by SI Admin and Developer.

Sub-Process 6: Insurance Claim

- a. Insurance claims in case of material damage during transportation.

The illustration of the diagram for material management and construction materials can be seen in Figure 5.14 below.

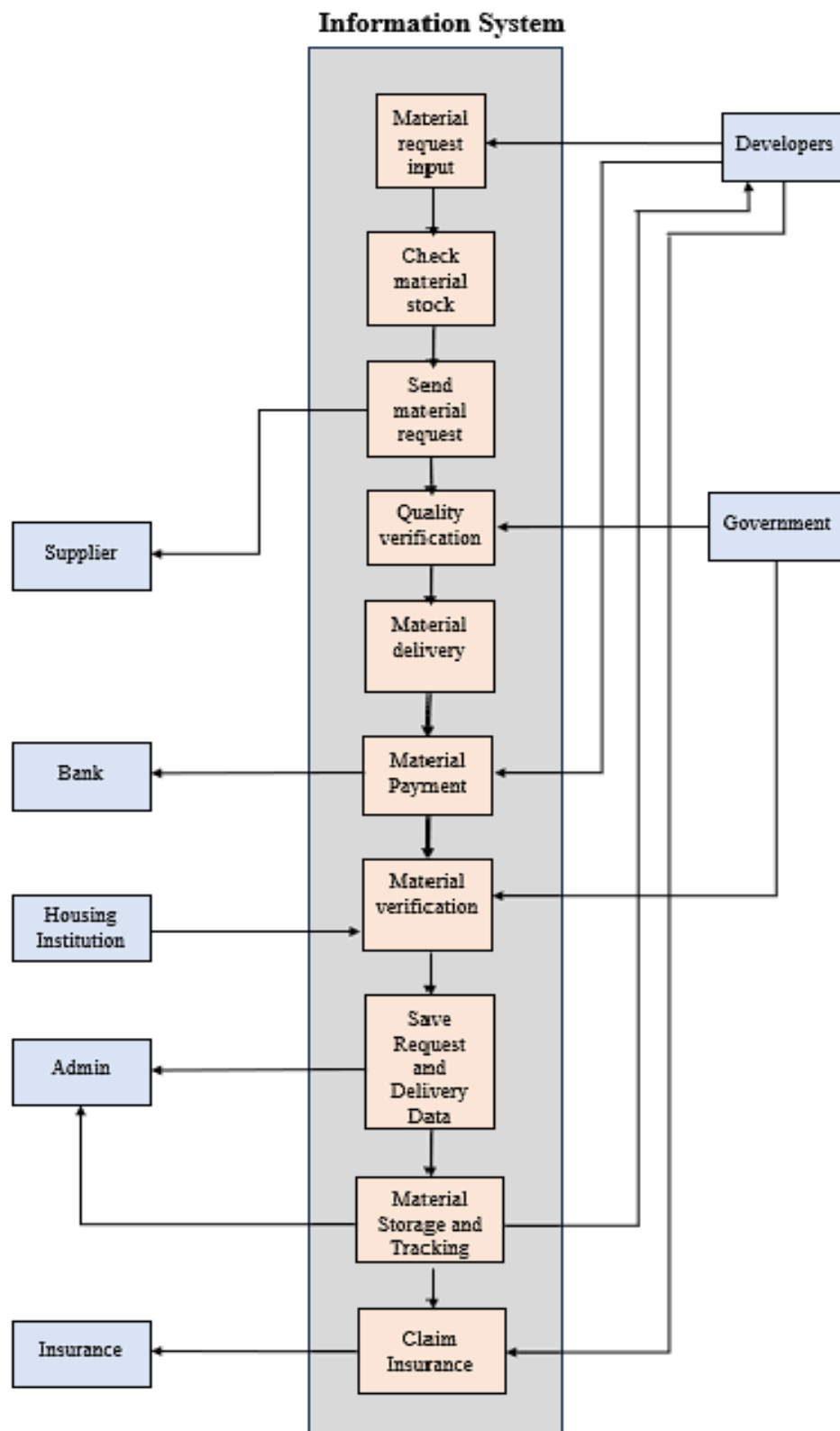


Figure 5.14 DFD Level 2 of Material Management and Construction Materials

4. Insurance Management and Project Protection

Sub-Process 1: Insurance Policy Input

- a. Project Owner inputs insurance policy data to IS Admin.
- b. SI Admin stores the data in the IS.

Sub-Process 2: Insurance Policy Verification

- a. Admin verifies the policy through the Insurance Institution.
- b. After verification, the policy data is stored in the IS System.

Sub-Process 3: Insurance Claims

- a. Project Owners, Developers, or Communities file claims with Insurance Institutions.
- b. Insurance Institutions process claims and provide evaluation results.

Sub-Process 4: Project Protection Evaluation Process

- a. Insurance Institutions conduct evaluations of project protection related to insurance.
- b. Evaluation data is sent to Developers and Project Owners.

Sub-Process 5: Earthquake Experts' Protection Advice

- a. Earthquake Expert provides recommendations on project protection based on earthquake risk.
- b. Recommendations are sent to Developers and Project Owners.
- c. Recommendation data is stored in the IS.

Sub-Process 6: Save Insurance and Claim Data

- a. Data from the entire insurance and claims management process is stored in the SI System, including claims submitted and their evaluation results.
- b. This data can be accessed by Project Owners, Developers, and SI Admins for monitoring.

The illustration of the diagram for insurance management and project protection can be seen in Figure 5.15 below.

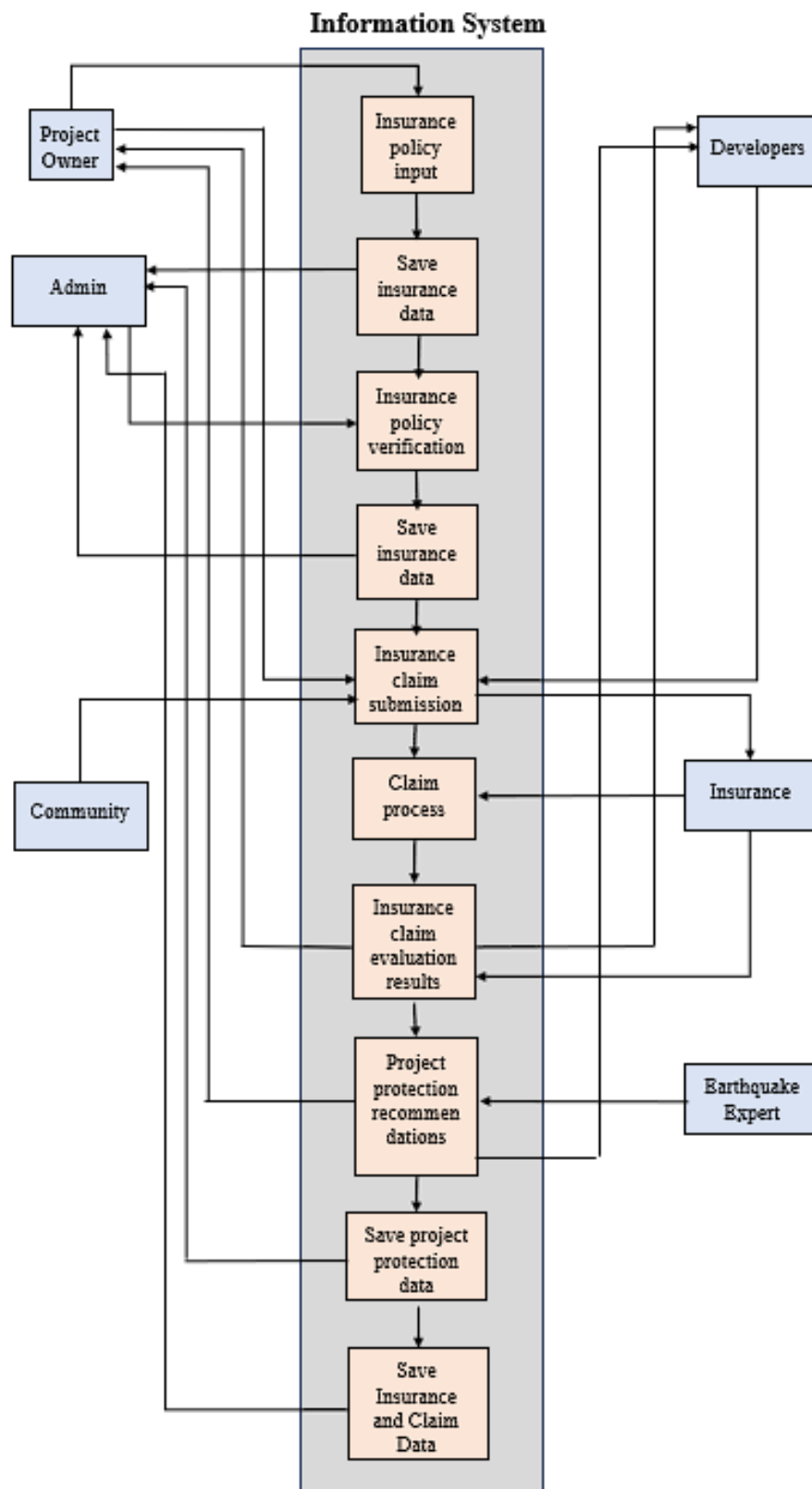


Figure 5.15 DFD Level 2 of Insurance Management and Project Protection

5. Technical Verification Management (Earthquake Expert)

Sub-Process 1: Construction Technical Data Input

- a. Developer sends construction technical data to Admin.
- b. Admin inputs technical data into the system.

Sub-Process 2: Verification of Technical Data by Earthquake Expert

- a. After the technical data is received, the Seismic Expert will verify the data to ensure that the construction meets seismic standards.

Sub-Process 3: Providing Technical Recommendations

- a. Earthquake Experts provide technical recommendations based on the verification results. If there is anything that is not appropriate, recommendations for improvement are sent to the Developer and Project Owner.

Sub-Process 4: Feedback to the Developer and Project Owner

- a. Recommendations or verification results are sent to the Developer and Project Owner to ensure changes or improvements are made if necessary.

Sub-Process 5: Technical Verification Data Storage

- a. All verified data and technical recommendations will be stored by the SI Admin in the system for documentation and tracking.

The illustration of the diagram for technical verification management can be seen in Figure 5.16 below.

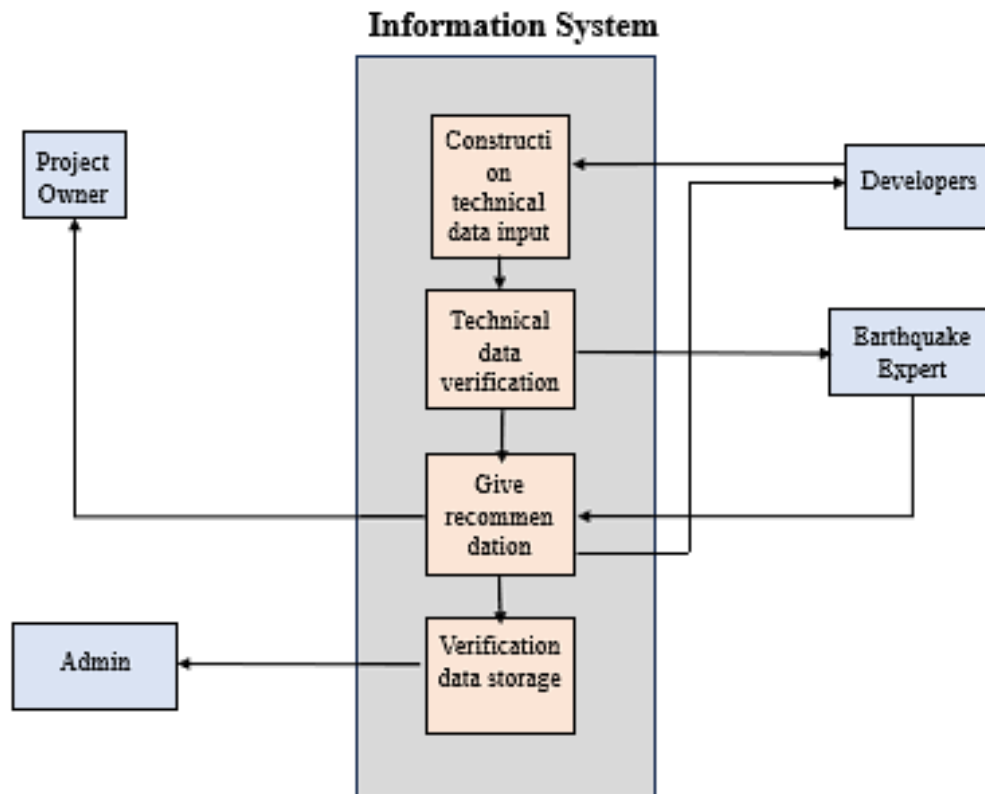


Figure 5.16 DFD Level 2 of Technical Verification Management

6. Project Report Provision Management

Sub-Process 1: Project Report Request Input

- a. The Developer or Project Owner submits a report request regarding the project status.

Sub-Process 2: Project Data Verification

- a. The Information System Admin checks the project data available in the system and ensures that the data is accurate and ready to be processed.

Sub-Process 3: Data Processing and Reporting

- a. Project data is processed by the Information System and project reports are prepared upon request.

Sub-Process 4: Send Report to Stakeholders

- a. Reports are distributed to Project Owners, Developers, Government, Banks, Communities, Insurance Institutions, Housing Institutions, and Suppliers if necessary.

The illustration of the diagram for technical verification management can be seen in Figure 5.17 below.

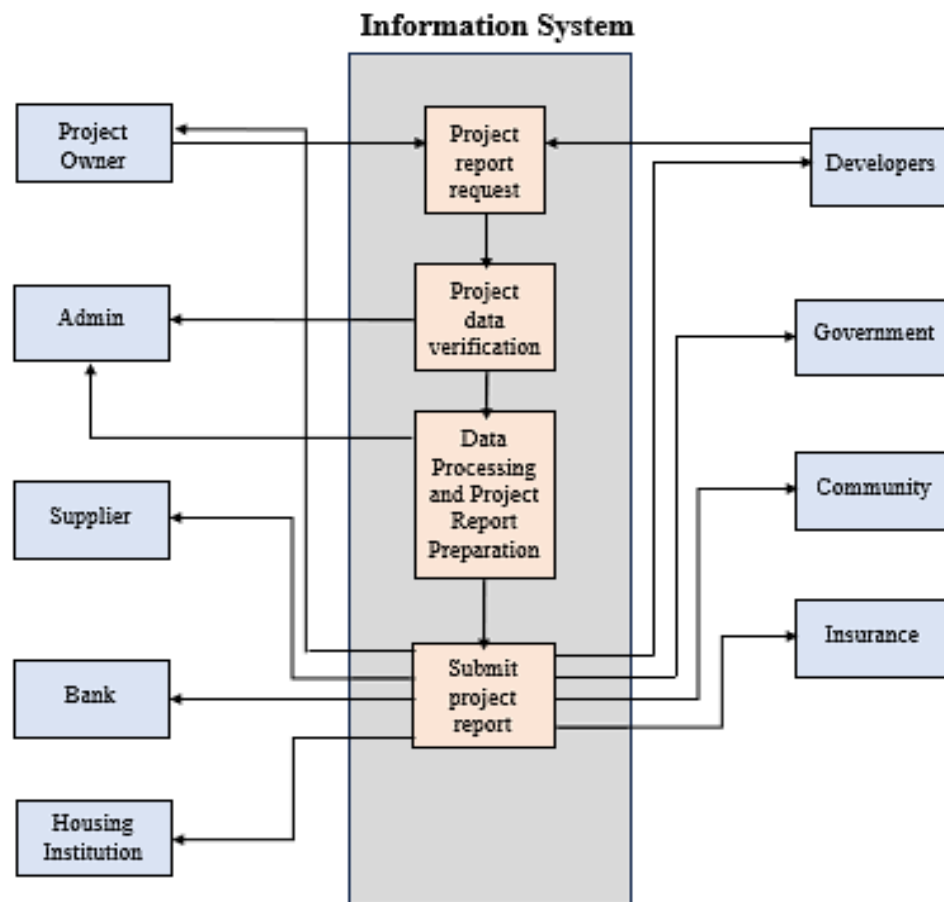


Figure 5.17 DFD Level 2 of Project Report Provision Management

The DFD Level 2 for the construction project management system effectively maps the critical processes and stakeholders involved in various aspects of the project lifecycle. These include Project Data Management, which ensures accurate and timely data flow between stakeholders; Financing and Payment Management, which coordinates financial transactions with banks and project owners; Material and Construction Material Management, where suppliers provide essential materials, ensuring the project's progress; Insurance

Management and Project Protection, which involves insurance institutions to safeguard the project from risks; and Technical Verification Management, where earthquake experts verify the technical feasibility of construction to ensure safety. Finally, Project Report Provision Management consolidates and distributes comprehensive project reports to all stakeholders, ensuring transparency and accountability throughout the project. Each process is interconnected, reflecting the systematic flow of information and collaboration, thus supporting improved productivity and efficiency in housing construction projects.

5.8 General Construction Process

Based on data obtained from several Developers and Contractors, the construction process in general will be shown in Figure 5.18 and Figure 5.19 below.

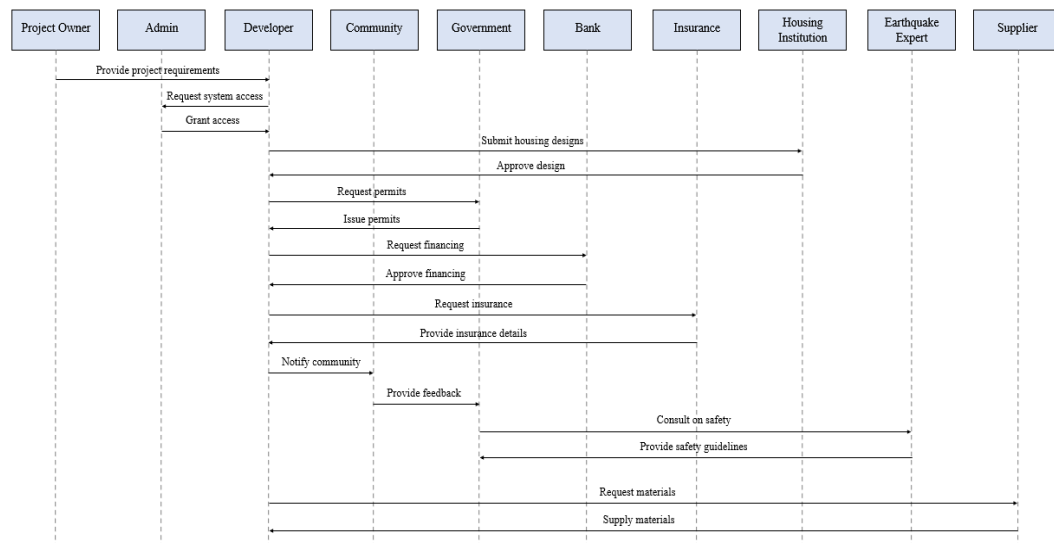


Figure 5.18 General Process of Construction

The diagram outlines a sequence of interactions between various stakeholders involved in a housing development project. It shows the collaborative process from the initial project requirements provided by the project owner through to material supply and safety consultations. The key elements in this process are:

1. Coordination and Access

The project owner sets the foundation by providing requirements, after which the admin grants access to the necessary systems, enabling the developer to proceed with submissions.

2. Design and Approvals

The developer submits housing designs that require government approval, ensuring the project complies with regulatory standards.

3. Permitting and Financing

The government is also involved in issuing permits after the developer's request. The bank approves the financing based on the project's financial needs, while insurance companies provide the necessary insurance coverage for the project.

4. Community and Feedback

There is a step dedicated to notifying the community about the project and obtaining feedback, emphasizing public involvement in the development process.

5. Safety and Material Supply

Safety guidelines are provided by earthquake experts and housing institutions, with materials being sourced from suppliers.

In conclusion, the diagram emphasizes the importance of collaboration between multiple entities—government, financial institutions, safety experts, and suppliers—through well-defined steps that ensure project success from planning to implementation, while also integrating community feedback and safety standards. The overall general construction process in the shape of a diagram can be seen below.

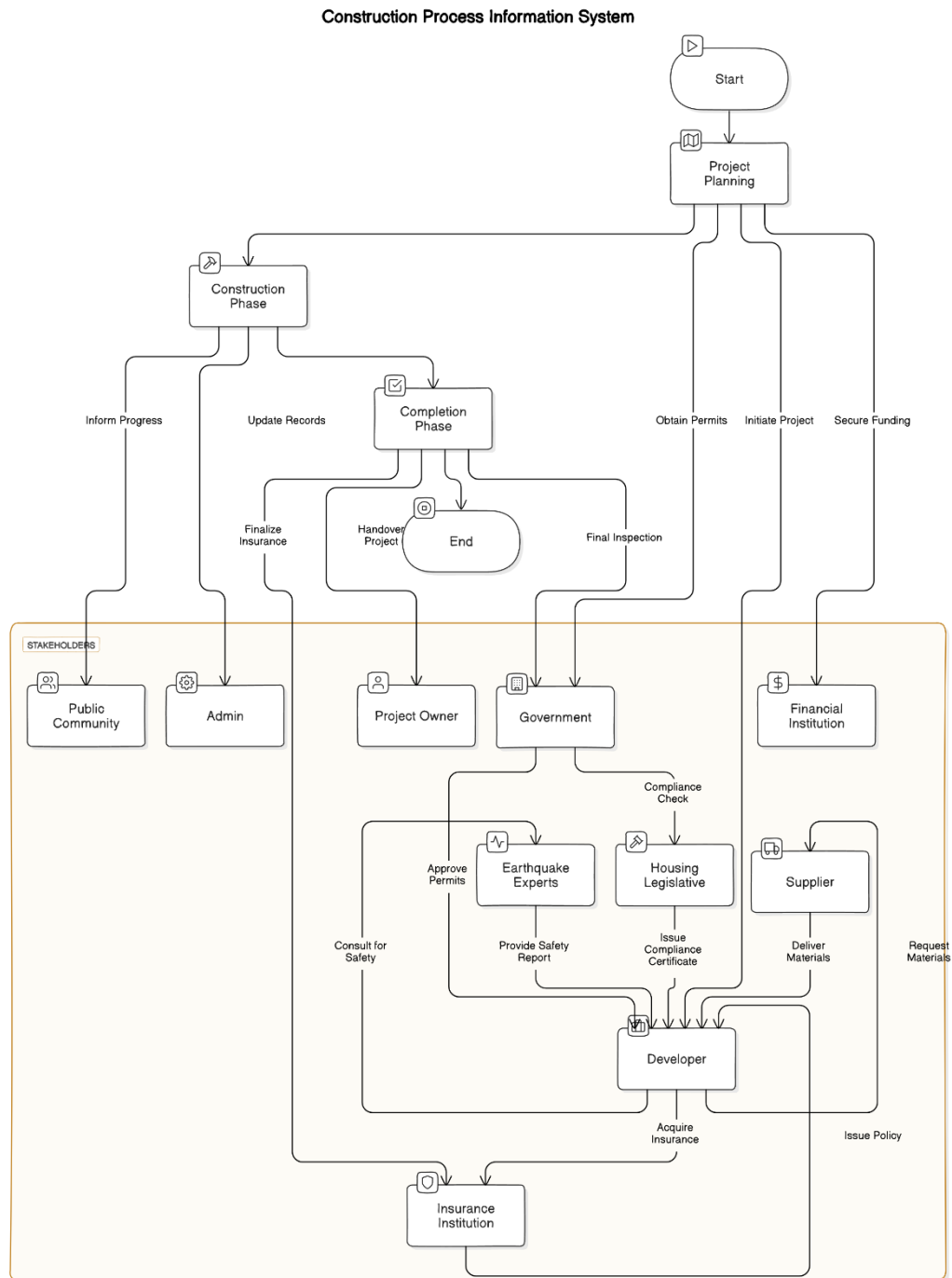


Figure 5.19 General Process of Construction Diagram

This process map demonstrates the importance of collaboration between multiple entities—project owners, developers, government agencies, financial institutions, safety experts, and the public community. The system ensures that construction projects are executed efficiently while meeting safety, compliance,

and administrative standards. Each phase is carefully monitored, with stakeholder involvement critical to the successful handover of the project.

CHAPTER VI

CONCLUSION

6.1 General

From the research and planning that has been done, it can be concluded that there is an information system in the construction industry. However, its features are not all there and the use has not been integrated optimally. This study aims to design a housing development management information system that can increase productivity through optimization of the construction process and better data integration among the various stakeholders involved. Based on the results of the analysis and design carried out, several things can be concluded as follows:

1. **Productivity Improvement through Information System Integration**

The management information system was designed using the Context Diagram and Data Flow Diagram approaches, which successfully identified efficient information flows among key stakeholders, such as the government, project owners, developers, suppliers, banks, and insurance institutions. With more structured data integration and communication, productivity in the housing development process can be significantly improved.

2. **Stakeholder Roles in the System**

Each stakeholder has an important role in the flow of information in the designed system. The government and housing institutions act as supervisors of regulations and quality standards, developers are responsible for the implementation of construction, and banks and insurance institutions support in terms of funding and risk protection. Community involvement as end users is also a concern in ensuring that housing needs and expectations are met.

3. **Benefits of Using Information Systems**

The proposed information system can provide convenience in project management, from the planning stage to reporting. The process of tracking project progress becomes more transparent, speeds up decision-making, and

reduces delays due to miscommunication. In addition, the existence of this digital-based system also supports secure data storage and can be accessed in real time by all authorized stakeholders.

4. Impact on Productivity Improvement in the Construction World

With an integrated information system, productivity in the construction world can experience a significant increase. This is because the system can simplify the project management process, reduce time spent on administrative work, and minimize errors due to lack of coordination or inaccurate information. With a more efficient flow of information, labour, and resources can be focused on more crucial aspects of construction, so that projects can be completed faster and with better quality.

5. Impact on Housing Availability

This integrated information system is expected to accelerate the housing development process, which will ultimately reduce the gap between housing needs and the availability of decent homes. A more productive construction process can provide solutions to the challenges of increasing population growth and the increasingly urgent need for housing.

The results of these recommendations are then drawn into diagrams called the *Context Diagram and Data Flow Diagram* of the information system. The recommended application or Information System can then be updated and put into the current web by an IT programmer and be implemented soon. Thus, by having an integrated Information System, the construction industry can increase productivity which will hopefully lead to the balance of increasing population and housing demands will be balanced.

6.2 Recommendation

For further development, it is necessary to implement this management information system in a real housing development project to validate and test the system's effectiveness in real time. Field testing can provide more accurate feedback on features that need improvement or adjustment. In addition, additional

features need to be developed, such as more in-depth seismic analysis and data integration with technology-based security systems.

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APPENDIX

Appendices 1: Questionnaire

Source person: Developers and Contractors

1. How would you describe the current construction process in terms of efficiency and productivity?
Most developers and contractors may describe the process as complex and slow, with a lot of manual work and dependencies on multiple parties, which often leads to delays.
2. What are the major challenges you face in coordinating with different stakeholders during a project?
Key challenges include communication delays, misalignment of schedules, and inconsistent documentation across various stakeholders such as suppliers, government, and subcontractors.
3. Who are the key stakeholders you engage with most frequently during the construction process?
Stakeholders typically include the Project Owner, Government Officials (for permits), Suppliers, Subcontractors, and Financial Institutions (for funding).
4. How do you currently manage permits and approvals from government authorities?
Many developers and contractors still use manual processes for managing permits, including submitting physical documents, attending in-person meetings, and awaiting approvals via email or phone.
5. Do you believe the current method of communication between different parties is effective? Why or why not?
The consensus may be that current communication methods are inefficient, as they often rely on emails, phone calls, or in-person meetings, which can lead to misunderstandings and delays.
6. How often do project delays occur due to issues with material supply or vendor management?

Delays due to material supply are common, occurring in around 30-40% of projects, mainly due to miscommunication with suppliers or lack of inventory visibility.

7. How do you track the progress of construction activities on-site?

Most use manual tracking methods such as spreadsheets, phone calls, and on-site visits, which may not provide real-time data and lead to inefficiencies in tracking actual progress.

8. What tools or systems do you currently use to manage project timelines, budgets, and resources?

Common tools include Excel spreadsheets, basic project management software, or paper-based systems, with a few using specialized construction management software.

9. How do you ensure compliance with safety standards and regulations during construction?

Compliance is generally maintained through regular inspections by safety officers, but this process could be more streamlined if safety reports and certifications were integrated into an information system.

10. Do you think having an integrated construction information system would help streamline stakeholder communication? Why?

Yes, an integrated system would centralize communication, ensuring that all stakeholders are on the same page and can access project updates, approvals, and requirements in real time.

11. How do you see an information system improving the permit approval process with government authorities?

An information system could digitize and automate the approval process, enabling developers and contractors to submit, track, and receive permits much faster than through traditional methods.

12. How would an information system assist in better project scheduling and resource allocation?

It could provide real-time data on resource availability, automatically adjust timelines, and improve the allocation of manpower and materials, thereby reducing delays and cost overruns.

13. In your opinion, would an information system help reduce project delays caused by material supply issues? How?

Yes, by allowing real-time tracking of material requests, inventories, and deliveries, such a system would alert suppliers and contractors of any delays or shortages well in advance, helping to mitigate disruptions.

14. How would integrating an information system improve project documentation and record-keeping?

An integrated system would digitize all records, enabling easy access, organization, and archiving of documents such as permits, contracts, safety reports, and invoices. This would also ensure transparency and accountability.

15. Do you believe using an information system could help improve overall project productivity? If so, in what ways?

Yes, it would improve productivity by reducing manual tasks, centralizing communication, enabling real-time updates, and automating processes like scheduling, material tracking, and compliance checks. This would result in faster project completion and reduced costs.

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Appendices 2: Questionnaire

Source person - IT Experts

1. What are the key components of an Information System (IS)?
Computer hardware, computer software, telecommunication, databases and data warehouses, human resources, and procedures.
2. How does a Data Flow Diagram (DFD) differ from a Context Diagram?
While a context diagram shows the system as a single process interacting with external entities, a DFD breaks down the system into multiple processes, illustrating how data moves between them, the external entities, and data stores.
3. Why are DFDs considered effective for system design?
DFDs are effective because they visually depict how data flows through a system, making it easier to identify potential inefficiencies, redundancies, and areas for improvement in data processing and handling.
4. What are the key components of a DFD?
The key components include processes, data flows, data storage, and stakeholders.
5. What guidelines should be followed when creating a Context Diagram?
Key guidelines include:
 - a. *Include only external entities and a single process representing the system.*
 - b. *Avoid showing internal system details.*
 - c. *Clearly label all entities, data flows, and the main process.*
 - d. *Ensure the diagram remains simple and easy to understand.*
6. How many levels of DFDs are typically created in system design?
DFDs generally follow a hierarchical structure:
 - a. *Level 0 (Context Diagram): Shows the system.*
 - b. *Level 1 DFD: Breaks the system into its main processes.*
 - c. *Level 2 (and below): Further decomposes the processes into sub-processes for more detailed analysis.*

7. What is the importance of identifying external entities in a Context Diagram?
Identifying external entities is crucial as they represent the sources and destinations of data flows in and out of the system. Understanding these interactions helps define system boundaries and ensures that key interactions are accounted for.
8. How can DFDs help in identifying potential system improvements?
By visually mapping out data flows and processes, DFDs make it easier to spot inefficiencies, such as redundant processes, bottlenecks in data handling, and unused data, which can then be optimized for better system performance.
9. What role do data stores play in a DFD, and how are they represented?
Data stores represent locations where data is stored for later use (e.g., databases, files). They are represented as open-ended rectangles and help in understanding how data is maintained and accessed in the system.
10. How do you determine the correct level of detail for a DFD?
The level of detail depends on the system's complexity and the audience. Start with a high-level (Level 0) overview and increase the detail in subsequent levels (Level 1, 2, etc.) to ensure the system's processes are fully understood without overwhelming the audience.
11. What common mistakes should be avoided when creating a DFD?
Balancing means that the data inputs and outputs in a higher-level DFD must match the data inputs and outputs of the lower-level DFDs. This ensures consistency across all levels and avoids introducing new data flows or entities as the diagram is decomposed.
12. How can DFDs support system documentation and communication?
DFDs provide a clear and visual way to document how data moves through the system, which makes it easier to explain the system to both technical and non-technical stakeholders, ensuring everyone has a common understanding.
13. In what phase of system development are DFDs most used, and why?
DFDs are most used during the system analysis and design phase because they help in understanding the current system's data flows and designing an

improved system. They provide a blueprint for developers to build the system based on clear data flow requirements.

14. Can a context diagram be used to design an IS, especially for construction?

Yes, a context diagram can help define the boundaries of the system, showing how it interacts with stakeholders. It provides a high-level overview of data flow and helps ensure that all external interactions are accounted for in the system design.

15. Can a data flow diagram be used to design an IS, especially for construction?

Yes, a DFD provides a visual representation of how data flows within the system, showing how inputs are processed and how outputs are generated. It allows developers to identify redundancies, inefficiencies, and bottlenecks in data handling, helping to optimize processes for better productivity.

IT Expert 1



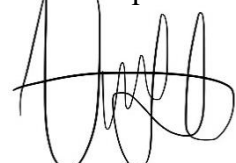
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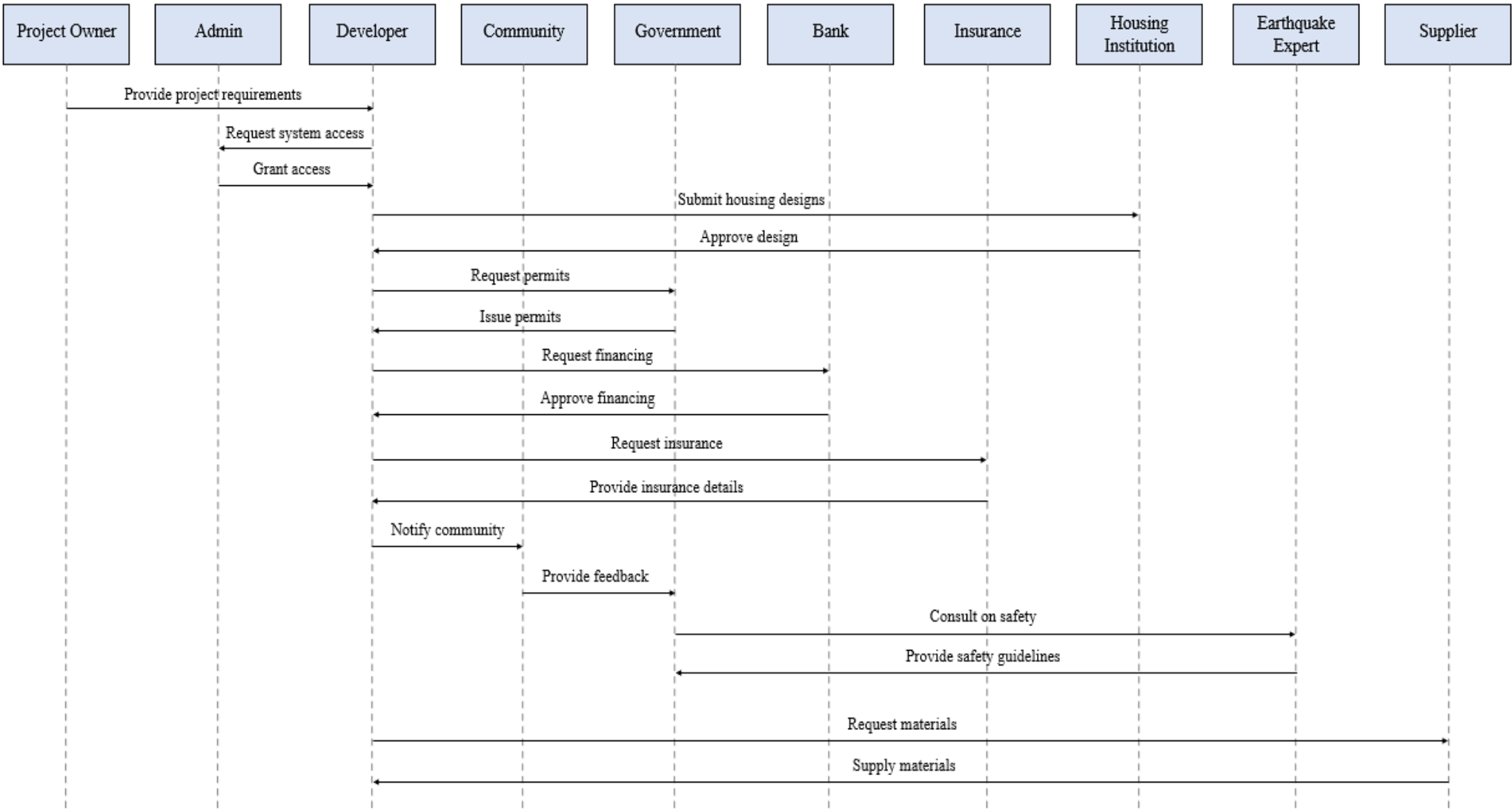
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Appendices 3: Illustration of Future Construction Process Through IS



Appendices 4: Illustration of Future Construction Process Through IS in a Diagram

Construction Process Information System

