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DESIGNING A COMMUNITY-BASED INFORMATION SYSTEM USING ACTIVITY THEORY: A CASE STUDY IN TAMAN LAPANGAN JAYA

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ABSTRACT

Effective communication and information sharing are vital for active neighbourhood participation, yet many communities still rely on informal group chats that lead to fragmented updates, lost documents, and frequent miscommunication. This study addresses this gap by applying Activity Theory (AT) to systematically identify requirements for a centralized community communication and information-sharing platform in Taman Lapangan Jaya. Using AT, the seven elements of activity were mapped to reveal key issues such as the communication bottleneck, lack of document accessibility, and unclear division of responsibilities. These findings informed the design of a web-based system featuring structured document repositories, role-based information management, and streamlined announcement functions. A rapid prototyping approach was adopted, with iterative feedback from residents and committee members. Usability evaluation indicated that the system improved information accessibility and reduced reliance on ad hoc messaging. This work contributes to requirements engineering practice by demonstrating the practical use of Activity Theory for analysing socio-technical interactions in a neighbourhood context and by offering a replicable model for designing community-based systems.

Keywords: *Activity Theory, Community-Based System, Requirements Engineering, Socio-Technical Systems*

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1. Introduction

Community can be defined in many ways. The most accurate definition describes it as a group of individuals who possibly share or perform similar responsibilities within the network (Alotaibi & Rhouma, 2022). Many detection methods are applied to identify communities, each designed for this purpose. Community detection helps to reveal the social structure and provides insights into the users within the network (Alotaibi & Rhouma, 2022; Keskinen et. al, 2021). This means communities can form around several factors such as geography, interests, professions, or social values. From a neighbourhood

perspective, it is characterized by connections, shared experiences and a sense of collective identity that strengthens social bonds and enhances the quality of life for residents.

A neighbourhood becomes a more harmonious place when everyone works together, with certain people assigned specific roles. The development of information technology cannot be separated from the rapid development of computer technology, because the computer is a medium that can provide convenience for humans in completing a job (Wulandari et. al, 2021). Changes and dynamics of society are getting faster along with the times and technology so that it requires quality information that is accurate, fast and precise (Firera et al., 2022). Information systems have changed the way people handle information, communicate, share knowledge, and perform tasks (Jalal & Al-Debei, 2013). It offers advantages for both individuals and organizations by enhancing effectiveness through improved communication between individuals and groups (Jalal & Al-Debei, 2013). At the neighbourhood level, integrating information systems into daily community life can provide a digital platform for residents to connect, collaborate, and manage shared resources more efficiently, thereby strengthening engagement and unity.

The case study for this research is Taman Lapangan Jaya, a neighbourhood that currently relies on WhatsApp group messaging for communication. While widely used, this platform has proven inefficient for managing community activities, as important updates are often fragmented within ongoing conversations, making it difficult for residents to access and track relevant information. To address these challenges, this study adopts Activity Theory as the guiding framework for requirements identification and system analysis in developing a community-based information system. Engeström's model of Activity Theory provides a structured, practice-based approach for understanding an activity system, where the key components - subject, object, and community - are mediated by tools, rules, and division of labour to achieve desired outcomes (Nikou, 2023). This framework enables a systematic analysis of community engagement, user interactions, and the social-technical dynamics underpinning the development process.

Activity Theory offers advantages over traditional requirement analysis methods, such as functional decomposition or use case analysis, because it extends beyond system features to examine how people, tools, rules, and the community interact. This broader perspective is particularly valuable in a neighbourhood context, where problems like miscommunication, scattered information, and unclear responsibilities are both technical and social in nature. By applying the seven elements of Activity Theory - subjects, objects, tools, rules, community, division of labour, and outcomes (Camargo-Henríquez & Silva, 2022) - this study was able to capture the community's social practices alongside its technical needs. In doing so, it addressed the main challenges in Taman Lapangan Jaya, especially fragmented communication, and weak information management. This approach enabled the design of a system that reflects real community practices, respects local norms, and supports the distinct roles of stakeholders (Nikou, 2023). In sum, Activity Theory not only strengthened the requirements gathering process but also ensured that the resulting system effectively met the needs of the community

2. An Overview of Activity Theory

The development of a neighbourhood community-based system is a challenging task, as it involves not only technological capabilities but also cultural and process-related issues. Conflicts may arise from differences in approach between the community and the system developers, potentially hindering the achievement of intended goals. Activity Theory can be applied to identify potential contradictions and transform them into triggers for change and opportunities for improvement through its analytical lens (Vincent, 2018).

Activity Theory is a philosophical and interdisciplinary framework for studying various forms of human behaviour and social practices (Adamides, 2022). It views the interaction between individuals, organizations, and social groups within their contextual environment—comprising culture, norms, rules, values, technologies, artifacts, and power structures—as the fundamental unit of social systems (Adamides, 2022). More than just a modelling approach used in desk-based case studies and action research, Activity Theory has a practice-oriented foundation. It employs the systemic construct of activity to represent, in a compact and structured form, collective practices directed toward motivational objectives, carried out by subjects within a mediated context (Adamides, 2022).

2.1 Elements of Activity Theory

In Engeström's activity system model (1987), depending on the level of analysis, the subject(s) can be a person, a group of persons, or even a group of organizations and communities that are the participants of the activity involved in carrying out the task. The object(ive) is the problem or, more generally, the reason the activity takes place. It may also be considered a problem space to be transformed or shaped by the activity. Tools/instruments are the means, referring to technological artifacts or other "softer" elements such as language and signs, through which the activity is carried out or mediated (Adamides, 2022).

The transformation of the object is possible only through these historically developed means, which also contribute to the construction of the subject's identity in relation to a specific activity. Rules are cultural norms, formal or informal rules, regulations, and institutions that govern the performance of the activity, for example, quality standards. Community refers to the various stakeholders involved in the activity, and division of labour signifies who is responsible for what, who does what, and how roles and power hierarchies are organized. Finally, the outcome of the activity is the intended result of carrying out the activity (Adamides, 2022).

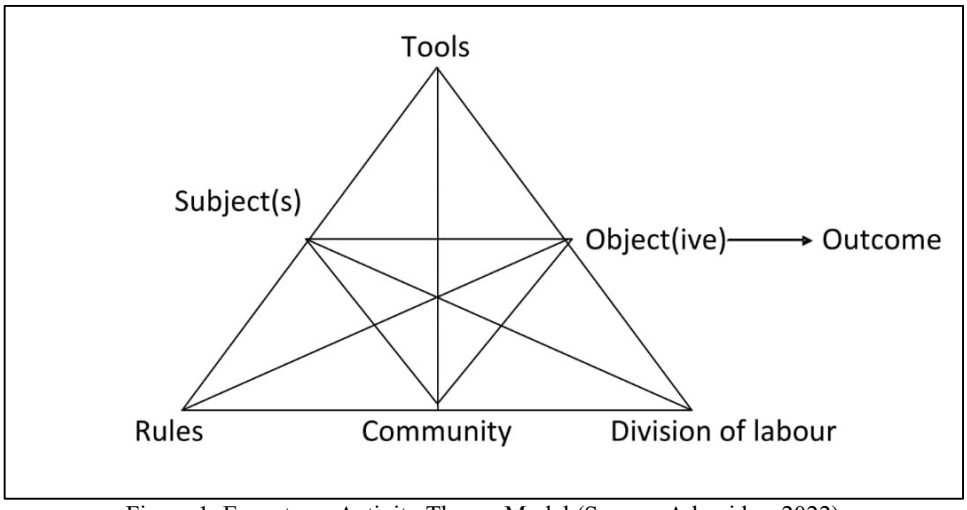


Figure 1. Engestrom Activity Theory Model (Source: Adamides, 2022)

3 Methodology

The prototyping methodology was ideal for developing a neighbourhood community-based system, as it effectively illustrated the system interface and features to the

stakeholders (Obayes & Hamzah, 2022; Saravanan, 2017; Subianto et al., 2023). According to Kamati et al. (2024), prototyping is useful because it allows the system to be shown to stakeholders early, enabling them to provide feedback from time to time. This makes it easier to improve the system based on users' requirements. The development in this project focused on seven phases, including requirements gathering, quick design, design, and coding. The iterative nature of the methodology was reflected in the quick design phase, where a prototype was built, evaluated by stakeholders, and refined based on their feedback, as shown in Figure 2. This cycle ensured continuous improvements to meet stakeholder needs. For this project, the customer evaluation phase was renamed stakeholders' evaluation and feedback to better reflect the community context. In addition, a planning phase was added before requirements gathering, and the requirements phase also incorporated analysis to thoroughly examine the collected information.

The development of the neighbourhood community-based system for Taman Lapangan Jaya followed this structured prototype approach. It began with planning activities such as problem identification, stakeholder interviews, literature review, and analysis of suitable development methodologies. Requirements gathering and analysis were conducted using Activity Theory, supported by diagrams, tables, and a detailed set of questions for both the committee and residents to capture functional and non-functional needs. A quick design was then created using low-fidelity sketches before moving to a high-fidelity prototype in a development environment. The prototype was presented to stakeholders on 27 December 2024, and since no further requirements were identified, the process advanced directly to the design phase. This involved developing class diagrams, database design, and data dictionaries, followed by the coding phase, where the system was implemented using PHP, JavaScript, Bootstrap, and jQuery for front-end functionality, with MySQL and phpMyAdmin managing the database.

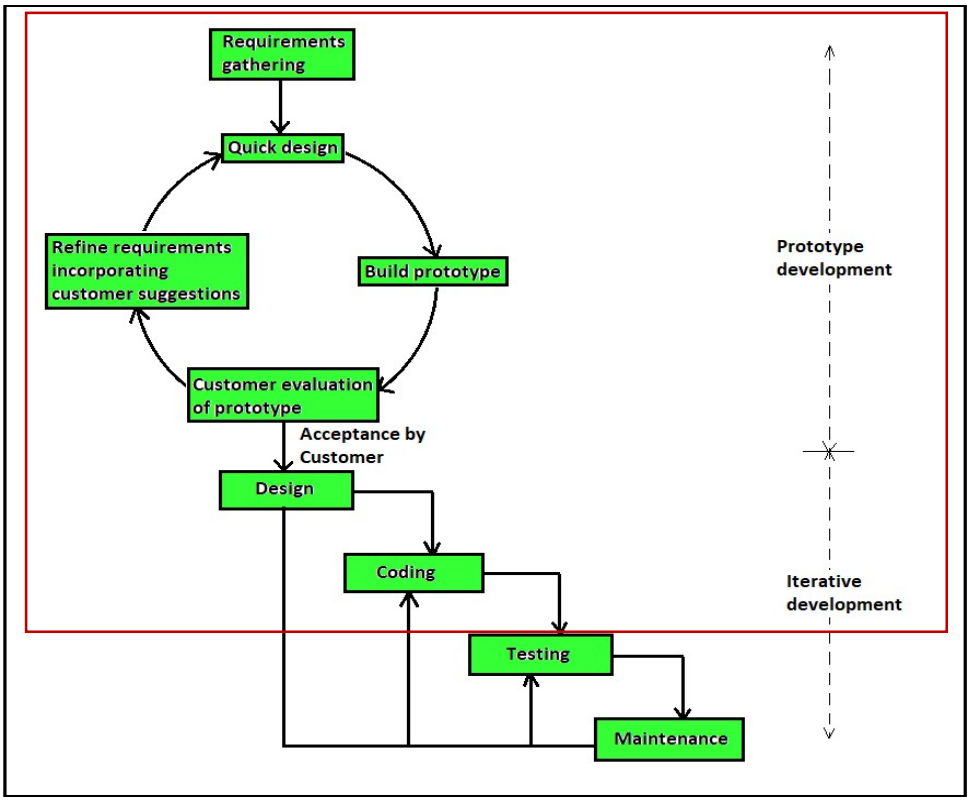


Figure 2. Phases in Prototyping Model (Source: Sirait & Gunawan, 2020)

4 Findings

The development of the neighbourhood community-based system for Taman Lapangan Jaya began with a thorough requirement gathering and analysis phase, where stakeholder interviews and Activity Theory were used to identify and analyze system requirements. This was followed by the creation of Activity Theory diagrams and the decomposition of activities to structure the system's workflow. The design phase involved developing low and medium-fidelity prototypes. Stakeholder feedback was then gathered to validate the design. Based on this input, the system structure was designed, including class diagrams and database models. Finally, the system was developed to provide a functional platform for community communication and resource management. Details of each phase are described in the sections below.

4.1 Requirements Gathering and Analysis

The requirements gathering and analysis process was important for developing the neighbourhood community-based system for Taman Lapangan Jaya. This phase included conducting interviews with stakeholders, gathering requirements, and performing requirement analysis. A focused element in this phase was the use of Activity Theory for requirements identification and analysis. The list of diagrams and tables produced for this phase included functional and non-functional requirements, Activity Theory diagrams, and decomposition of activities.

The interview method was chosen as a suitable qualitative approach for gathering system requirements because it allows direct engagement with stakeholders. Through face-to-face conversations, the researcher was able to understand the specific needs, challenges, and expectations of the community. This method is effective in capturing detailed and context-specific insights that might not be revealed through surveys or observation alone. It also helped build trust with the participants, leading to more open and informative responses.

Several questions were mapped to functional requirements for the system's development. Meanwhile, other questions provided valuable details that would be used as content within the neighbourhood community-based system. The same list of questions also helped in mapping each detail to the corresponding element in Activity Theory. Below is a list of the questions asked to the stakeholders.

Questions for the President and Committee

- What is the total number of residents in Taman Lapangan Jaya?
- What age groups make up most of the neighbourhood (children, young adults, or older adults)?
- Is there any association besides the neighbourhood association in Taman Lapangan Jaya?
- Are there any communication channels besides WhatsApp that you use?
- Would a website that can display all information about Taman Lapangan Jaya be useful?
- If so, who is the person in charge who should have access to manage and update the Taman Lapangan Jaya website?
- Would it be okay if the person in charge needs to create an account and log in to the system to manage the Taman Lapangan Jaya Website?
- What kind of information should the person in charge be able to update, edit and delete?
- How do you currently handle resident concerns, emergencies, or complaints, and is this process effective?
- What kind of events and activities are held in Taman Lapangan Jaya?

- How frequently are events and activities held in Taman Lapangan Jaya?
- How are events or activities currently organized?
- How do residents currently register for events held at Taman Lapangan Jaya? Is there a form to fill out?
- What kind of details do residents need to fill out to register an event?
- Would a website that can display all events and activities held in Taman Lapangan Jaya be useful?
- If so, who is the person in charge who should have access to manage and update events and activities on the website?
- What kind of event and activity information should the person in charge be able to update, edit and delete?
- If so, what event details should be displayed?
- Do residents have to book or rent the facilities (e.g., the football court), or are they accessible for general use?
- What type of services or products do residents most frequently request or buy?
- Are there any specific platforms or events to help residents showcase their services or products?
- Would a website that promotes Taman Lapangan Jaya's products and services be useful?
- If so, what service or product details should be displayed?

Questions for Residents

- How do you currently receive updates about community events and announcements? Is this method effective for you?
- How do you currently report issues? Is this process efficient?
- How can you contact the president or committee members if you encounter an issue?
- Would a website that can view all information about Taman Lapangan Jaya be useful?
- If so, what kind of information can be viewed on the website?

4.2 Findings from Interviews

Requirements were gathered from the president and secretary of the community, as well as from some residents of Taman Lapangan Jaya. A group interview was conducted with the president and secretary, while one-on-one interviews were held with the residents. Table 1 shows the details of the interviewees and their roles in the community.

Table 1. Interviewee Details

Interviewee Name	Role
En. Rahim	President of Taman Lapangan Jaya Community
En. Azhar	Secretary of Taman Lapangan Jaya Community
En. Reduan	Residents of Taman Lapangan Jaya
En. Puhad	Residents of Taman Lapangan Jaya

The responses were then translated to make them readable and understandable for further analysis in order to collect the necessary information. The tables below show samples of the analysis of the interviews for several functional requirements, such as registering an account, viewing information, and managing information.

4.2.1 Register Account

Table 2. Analysis of the Interview for Register Account

	Question	Answer	Identified Requirement	Activity Theory
1.	Would it be okay if the person in charge needs to create an account and log in to the system to manage Taman Lapangan Jaya?	It would be okay since only En. Azhar is the person in charge of managing the website	Only En. Azhar should be able to create and log in to the system	Subject(s): - En. Azhar – Committee of Taman Lapangan Jaya Object(ive): - Unregistered User Tools: - Neighbourhood Community-Based System Rules: - Only the assigned committee is allowed to register – En. Azhar Division of Labour: - President of Taman Lapangan Jaya - Committee of Taman Lapangan Jaya Community: - Community of Taman Lapangan Jaya - Residents of Taman Lapangan Jaya Outcome: Registered User

4.2.2 View Taman Lapangan Jaya Information

Table 3: Analysis of the Interview for View Taman Lapangan Jaya Information

	Question	Answer	Identified Requirement	Activity Theory
1.	Would a website that can display all information about Taman Lapangan Jaya be useful?	Yes, because residents and people not from this neighbourhood can get information about Taman Lapangan Jaya	Residents and the public should be able to access details about Taman Lapangan Jaya	Subject(s): - Public Object(ive): - Designated information Tools: - Neighbourhood Community-Based System Rules: - Public accessibility, which allows viewing information without a login - Information should be organized into relevant sections, such as about us, services, gallery and more, to be viewed Division of Labour: - President of Taman Lapangan Jaya - Committee of Taman Lapangan Jaya Community: - Community of Taman Lapangan Jaya - Residents of Taman Lapangan Jaya Outcome: Information acquired
2.	What kind of information can be viewed on the website?	About Taman Lapangan Jaya, promote services that we provide, incentives for medical, education and a list of all events and activities in Taman Lapangan Jaya	Information includes services, medical and education incentives, and event details.	
3.	Do residents have to book or rent the facilities (the football court) or are they accessible for general use?	All the facilities in Taman Lapangan Jaya are accessible for general use	Display facility accessibility details	
4.	What type of services or products do residents most frequently request or buy?	Services - canopy rental and catering Products - mostly food	Information about frequently requested services	
5.	Would a website that promotes Taman Lapangan Jaya's products and services be useful?	Yes, because it will be helpful for people looking for a certain service and product	The website should display Taman Lapangan Jaya's products and services	
6.	What service or product details should be displayed?	Name of the product or services, details and phone number of the person who sells or provides the product and services	Details include name, description and contact number of the provider	

4.2.3 Manage Taman Lapangan Jaya Information

Table 4: Analysis of the Interview for Manage Taman Lapangan Jaya Information

	Question	Answer	Identified Requirement	Activity Theory
1.	Who is the person in charge who should have access to manage and update the Taman Lapangan Jaya Website?	Only En. Azhar can have access to manage the Taman Lapangan Jaya website	Only En. Azhar can manage the Taman Lapangan Jaya Website	Subject(s): - En. Azhar – Committee of Taman Lapangan Jaya Object(ive): - Scattered data Tools: - Neighbourhood Community-Based System Rules: - En. Azhar needs to log in to access and manage Taman Lapangan Jaya information - Information should be organized into relevant sections such as about us, services, gallery for easy management Division of Labour: - President of Taman Lapangan Jaya - Committee of Taman Lapangan Jaya Community: - Community of Taman Lapangan Jaya - Residents of Taman Lapangan Jaya Outcome: Managed information in Neighbourhood Community-Based System
2.	What kind of information should the person in charge be able to update, edit and delete?	About us, events and activities, gallery which contains all photos related to Taman Lapangan Jaya, complaint section, services or products	En. Azhar can update us on events, gallery, complaints, services and products	
3.	How do you currently handle residents' concerns, emergencies or complaints and is this effective?	They will contact En. Rahim for help. If it is a major issue, En. Rahim will get help from the committees or other residents	A complaint section should be available for reporting issues	

4.3 Requirements for Neighbourhood Community-Based System

Table 5 below shows the full list of functional and non-functional requirements elicited for the neighbourhood community-based system of Taman Lapangan Jaya. The list includes all the functions aimed at supporting communication, collaboration, and management of activities held in the neighbourhood. These requirements are important for providing an efficient system for daily community operations.

Table 5. Table Functional and Non-Functional Requirements

Functional Requirements	Non-Functional Requirements
Register Account	Registration should be completed within 2 seconds under normal conditions
View Taman Lapangan Jaya Information	Information should load within 2 seconds
Manage Taman Lapangan Jaya Information	Updates must be reflected in real-time across the system
View Taman Lapangan Jaya Event	Event details should load in under 2 seconds
Manage Taman Lapangan Jaya Event	Updates must be consistent and accurate
Register Event	Event registration should complete within 2 seconds under normal conditions

4.4 Activity Theory Diagrams

After all requirements were listed, the Activity Theory diagrams were created for each activity involved in the neighbourhood community-based system. All components in the diagram were determined based on the results from data collected from the interview findings. Below is the application of the Activity Theory model in the development of the system. Each element of Activity Theory can be explained as follows:

4.4.1 Subject(s)

This element refers to the stakeholders, who are the residents of the neighbourhood, as they are the people involved in using the community-based system. The task for this element requires a deep understanding of the roles and responsibilities of each person involved, as each activity will have different subjects based on their main goal to transform the object into outcomes.

4.4.2 Object(ive)

Objectives refer to material things, or they can be less tangible (Kamaruddin et al., 2011). The focus of the objective is that subjects are using the tools for a certain activity to transform from the objective to outcomes. This transformation highlights the dynamic nature of the object, which can be manipulated. This element applies to stakeholders using the system for a certain activity to transform the objective into an outcome.

4.4.3 Tools

The tools are the technology platform that will be used by the stakeholders and residents of the community. This will be the focus, as it aligns with the objective of developing the neighbourhood community-based system.

4.4.4 Rules

Rules might include community guidelines for participation, privacy policies, and regulations that ensure the fair use of community resources. This element applies to the neighbourhood community-based system, where interactions for a certain activity are mediated by rules.

4.4.5 Division of Labour

This element defines each task or role of the stakeholders within Taman Lapangan Jaya, clarifying who is responsible for handling the system and its functions.

4.4.6 Community

The community is involved in and affected by the use of the neighbourhood community-based system of Taman Lapangan Jaya. The community serves as the organizational group responsible for transforming the object into outcomes based on the activity involved.

4.4.7 Outcome

Outcome refers to the goals that the subjects aim to accomplish based on the activity involved.

4.5 Outcome

Activity Theory Diagrams for Neighbourhood Community-Based System of Taman Lapangan Jaya. The division of labour component for each activity remains the same for all activities, as the delegation of work among participants is assigned to the president and the committee of Taman Lapangan Jaya. Similarly, the tool for all activities also remains the same, as all subjects of all activities are using the neighbourhood community-based system. The organizational groups or communities are the same across all activities, except for Manage Event and Register Event, where collaboration depends on the organizer and the neighbourhood to ensure the success of the event. Figures depicted below show several Activity Theory diagrams modelled for the neighbourhood community-based system of Taman Lapangan Jaya.

4.5.1 Activity: Register Account

Figure 3 below shows the Activity Theory diagram for the Register Account activity. This figure illustrates how the subject of the activity uses the neighbourhood community-based system to create an account. This activity is specifically created for the assigned user, En. Azhar, one of the committee members, is to register accounts as he is the person in charge of handling the system. The objective of this activity is to transform an unregistered user into a registered user. The rule applied to the Register Account activity is that only the assigned committee member, who is En. Azhar is allowed to perform the registration.

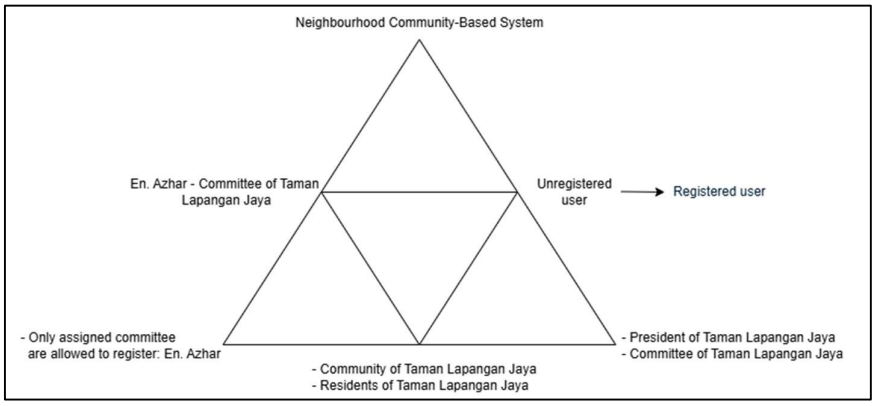


Figure 3. Activity Theory Diagram for Register Account

4.5.2 Activity: View Taman Lapangan Jaya Information

Figure 4 below shows the Activity Theory diagram for the View Taman Lapangan Jaya Information activity. This figure illustrates how the subject of the activity uses the neighbourhood community-based system to view all the information available in the

system. The objective of this activity is to transform designated information into information that is acquired. There are several rules applied to this activity: the information must be publicly accessible, it can be viewed without logging in, and it should be organized into relevant sections such as About Us, Services, Gallery, and more for easy viewing.

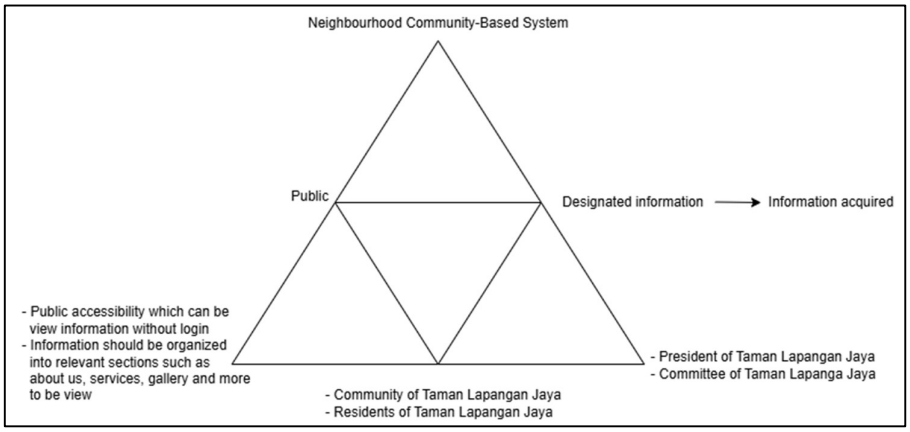


Figure 4: Activity Theory Diagram for View Taman Lapangan Jaya Information

4.5.3 Activity: Manage Taman Lapangan Jaya Information

Figure 5 below is the Activity Theory diagram for the Manage Taman Lapangan Jaya Information activity. This figure illustrates how the subject of the activity uses the neighbourhood community-based system to manage all the information within the system. This activity is specifically assigned to En. Azhar, the committee member responsible for managing information in the neighbourhood community-based system. The objective of this activity is to transform scattered data into well-managed Taman Lapangan Jaya information. There are several rules applied to this activity: En. Azhar must log in to access the management functions, and the information should be organized into relevant sections such as About Us, Services, and Gallery for easier management.

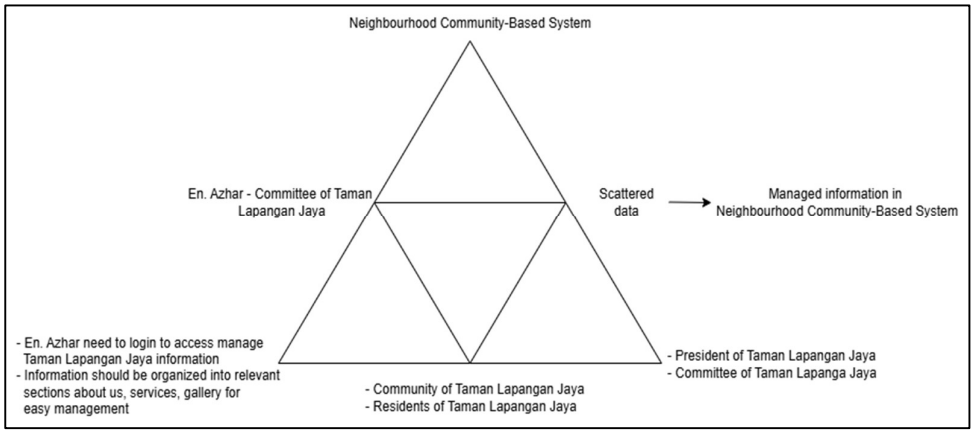


Figure 5. Activity Theory Diagram for Manage Taman Lapangan Jaya Information

4.6 Decomposition of Activities

The decomposition of activities is presented in a series of tables that represent the flow of the system for each activity. Each activity is explained in more detail by breaking it down into one or more actions. Each action is further divided into one or more operations. Below are the tables showing the breakdown from activities to actions and operations.

4.6.1 Decomposition of 'Register Account' Activity

Table 6 below provides a breakdown of the Register Account activity into several actions and operations.

Table 6. Table Decomposition of 'Register Account' Activity

Activity	Actions	Operations
Register Account	Enter personal particulars	User enters personal details such as username, name, role, phone number and e-mail
		User clicks the 'register' button
	Update status	User will be alerted with a dialog box if the user has not fully entered personal details
		User will be alerted with a dialog box for successful registration

4.6.2 Decomposition of 'View Taman Lapangan Jaya Information' Activity

Table 7 below provides a breakdown of the View Taman Lapangan Jaya Information activity into several actions and operations.

Table 7. Table Decomposition of 'View Taman Lapangan Jaya Information' Activity

Activity	Actions	Operations
View Taman Lapangan Jaya Information	User searches for Taman Lapangan Jaya and clicks on the relevant link	User searches the Taman Lapangan Jaya website in the search bar and selects the appropriate link from the search results
	User looks for information on the Taman Lapangan Jaya website	The home page will be displayed when the user clicks on the Taman Lapangan Jaya website link
		User will use the navigation bar at the top of the page to navigate the page containing the information
		User interacts with any filters or menus if required to refine the information

4.6.3 Decomposition of 'Manage Taman Lapangan Jaya Information' Activity

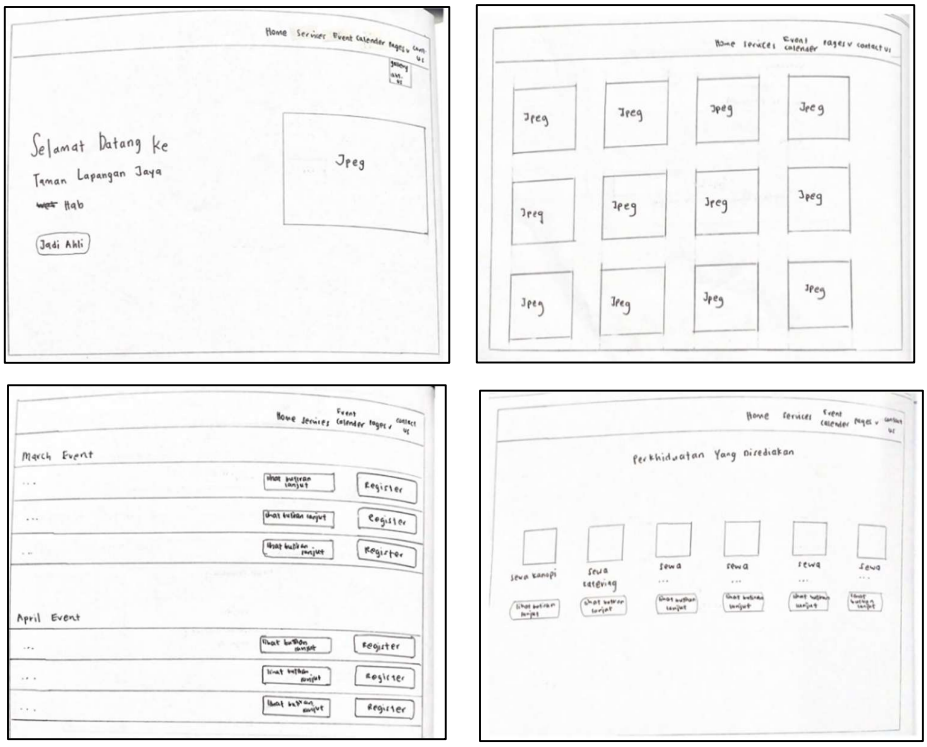
Table 8 below provides a breakdown of the Manage Taman Lapangan Jaya Information activity into several actions and operations.

Table 8. Table Decomposition of 'Manage Taman Lapangan Jaya Information' Activity

Activity	Actions	Operations
Manage Taman Lapangan Jaya Information	Log in	Refer to the decomposition of the 'Login' activity
	Display the admin page for the Taman Lapangan Jaya website	The admin dashboard will be displayed when the user has logged in
		Side bar menu will display all types of information that can be added, updated and deleted
		Each type of information will have an option for the user to add new information and view all information details
	Create new Taman Lapangan Jaya Information	The user chooses the type of information to add
		User enters title and description if needed
		Attach supporting documents or images if necessary
		Users also need to choose between the active or inactive options for each information
		Click the 'Submit' button to apply changes
	Create a new information status	User will be alerted to review the updates
	Update Taman Lapangan Jaya Information	User navigates to the type of information that needs to be updated
		Enter the new information in the relevant fields such as new title, descriptions and status
		Attach supporting documents or images if necessary
		Click the 'Submit' button to apply changes
	Update the new information status	User will be alerted to review the updates
	Delete Taman Lapangan Jaya information	User navigates to the type of information that needs to be deleted
		User clicks the 'Delete' button to continue deleting the information
		A pop-up message will be displayed asking for user confirmation to delete the information
	Delete information status	User will be alerted to review the updates after clicking the 'Okay' button

4.7 Quick Design

The quick design phase is where a storyboard for the neighbourhood community-based system was sketched based on findings from stakeholder interviews, as well as insights from the literature review and studies on similar systems. Figure 6 shows snapshots of the sketched storyboard for the home page, service page, event page, and gallery page. This is a low-fidelity prototype, which is a hand-sketched prototype that provides a better understanding of how the neighbourhood community-based system functions.



4 Figure 6. Neighbourhood Community-Based System Storyboard Sketched

This phase involves transitioning the prototype from a low-fidelity prototype to a medium-fidelity prototype, which is designed using Canva. The medium-fidelity prototype provides a more detailed and refined version of the system's interface compared to the initial hand-drawn sketches. By using Canva, the design process becomes more efficient, incorporating colours, images, and interactive elements that closely resemble the final system. These prototypes will also be referred to as the user interface for the neighbourhood community-based system. Figure 7 shows snapshots of the system storyboard for the Laman Utama page, Perkhidmatan page, Aktiviti page, and Tentang Kami page.

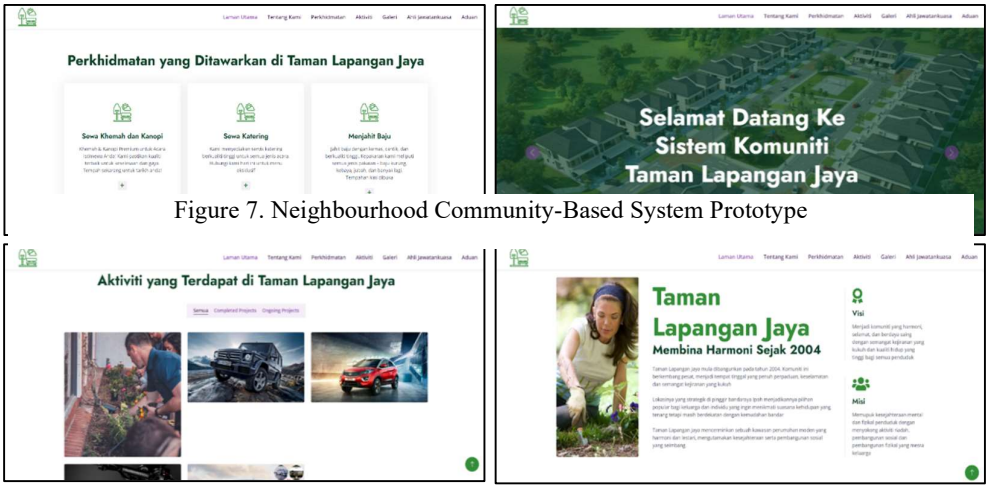


Figure 7. Neighbourhood Community-Based System Prototype

4.9 Stakeholder Evaluation and Feedback

A prototype presentation was held with En. Rahim, the community representative, on 27 December 2024 at the Taman Lapangan Jaya community hall. The session provided an opportunity to validate the prototype design, confirm alignment with user expectations, and collect detailed feedback before proceeding to full-scale system development. Overall, the stakeholder expressed satisfaction with the prototype and emphasized the importance of including comprehensive community-related information. Specifically, he recommended incorporating content on available incentives (e.g., education, bereavement, and medical assistance), descriptions of community services, and an inventory of facilities within Taman Lapangan Jaya. Additionally, the stakeholder requested that the system interface and content be presented in Malay to ensure accessibility and ease of understanding for all residents.

4.10 Design of Neighbourhood Community-Based System

The design of the neighbourhood community-based system was developed to establish a clear and organized structure that ensures smooth functionality. As the user interface had already been addressed during the prototyping phase, this stage focused on producing comprehensive software design documentation, including a domain class diagram and database design to define the system's structure and data flow. The domain class diagram consisted of ten classes: sitesetting, slider, enquiry, projectcat, team, services, project, visitor, projectregister, and login, as shown in Figure 8. For the database, MySQL was used to support local database maintenance during development. The system was implemented using PHP as the main server-side programming language to process requests, interact with the database, and manage dynamic content. Bootstrap was applied to create a responsive and mobile-friendly interface, while JavaScript enhanced system interactivity with features such as form validation and dynamic content updates. Together, these technologies resulted in a robust and user-friendly system tailored for the neighbourhood community.

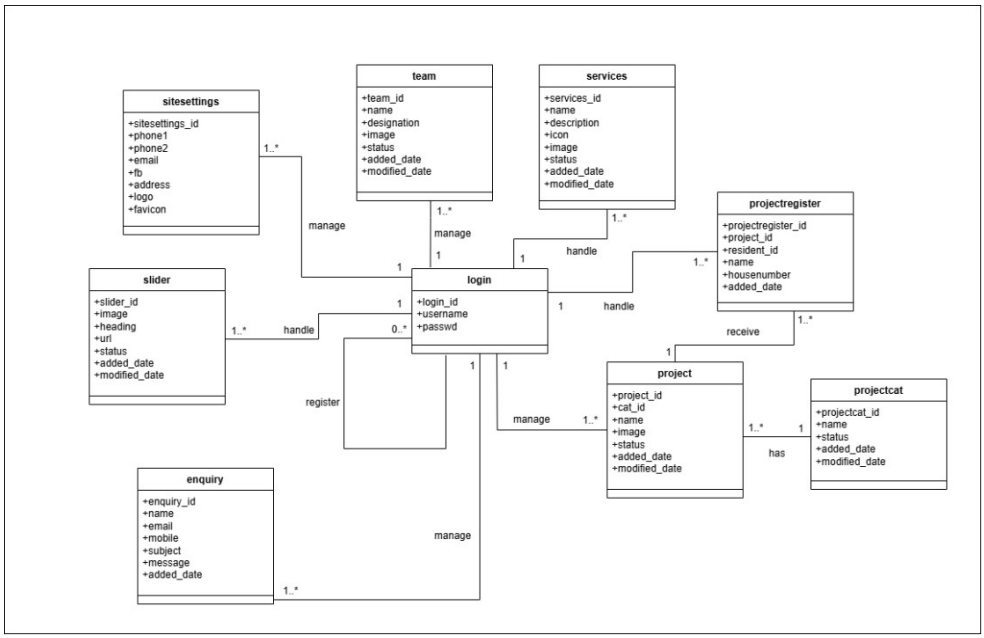


Figure 8. Domain Class Diagram for Neighbourhood Community-Based System

5 Discussion

This study demonstrated the usefulness of Activity Theory (AT) as an analytical framework for requirements identification and system design in a neighbourhood context. Revisiting the mappings in Table 9 highlights how interview data were systematically connected to AT elements, and how this guided the requirements specification process. For instance, Subjects captured the key actors (e.g., En. Azhar as the committee member responsible for managing the website and the residents as information consumers), leading to the requirement for role-based access and management privileges. Objects such as "unregistered user," "designated information," and "scattered data" clarified the problem states to be transformed into outcomes, which shaped requirements such as account registration, structured information sections, and content management modules. Rules (e.g., login requirements for administrators and public access for residents) resulted in separating the public interface from the secure admin dashboard, ensuring information is organized and accessible only to authorized users when necessary. Division of labour clarified that content management should be handled by the committee, while residents remain consumers of information, a distinction reflected in the design of the admin panel and user interface.

Table 9. Functional Requirements Summary

Activity Theory Elements	**Functional Requirements**		
	Register Account	**View Taman Lapangan Jaya**	**Manage Taman Lapangan Jaya**
Subject(s)	En. Azhar – Committee of Taman Lapangan Jaya	Public	En. Azhar – Committee of Taman Lapangan Jaya
Object (ive)	Unregistered User	Designated information	Scattered data
Tools	Neighbourhood Community-Based System	Neighbourhood Community-Based System	Neighbourhood Community-Based System
Rules	Only the assigned committee is allowed to register – En. Azhar	- Public accessibility which allows users to view information without logging in - Information should be organized into relevant sections	- En. Azhar needs to log in to access - Information should be organized into relevant sections
Division of Labour	- President of Taman Lapangan Jaya - Committee of Taman Lapangan Jaya	- President of Taman Lapangan Jaya - Committee of Taman Lapangan Jaya	- President of Taman Lapangan Jaya - Committee of Taman Lapangan Jaya
Outcome	Registered User	Information acquired	Managed information in the Neighbourhood Community-Based System

By applying AT, the project went beyond listing functional requirements and was able to capture the social context and workflows that drive system use. This influenced not only what features were included but also how they were implemented. For example, the decision to provide clear information categories (About Us, Services, Events) and structured navigation came directly from the emphasis on information organisation in the Rules and Object elements. Similarly, the use of role-based access control was motivated by the Division of Labour mapping, ensuring that responsibilities identified in the activity system were preserved in the final implementation. In this way, AT shaped the design decisions and ensured that the resulting platform aligned with community practices, improved communication flow, and addressed the issues of fragmented information identified at the outset.

6 Conclusion

This study applied Activity Theory (AT) to guide the requirements identification, design, and development of a neighbourhood communication and information-sharing platform for Taman Lapangan Jaya. Through systematic mapping of stakeholder interviews to functional and non-functional requirements, AT ensured that the final system reflected community roles, rules, and interactions. The resulting design artifacts - domain class diagram, database schema, and interface structure - provided a strong foundation for implementation, while the developed PHP, Bootstrap, and JavaScript-based system delivered a responsive and user-friendly solution to address fragmented communication and information access issues.

The main contribution of this work lies in demonstrating how AT can be practically applied in a real-world community context to produce well-structured requirements and guide socio-technical system design. The outcome offers a replicable approach for other neighbourhood associations seeking to improve information flow and community engagement.

Several limitations should be acknowledged. First, managing both structured and unstructured data posed challenges, as the database schema required optimisation to store and retrieve information efficiently while maintaining scalability. Second, implementing interactive features such as real-time chat and discussion forums introduced additional complexity, particularly in ensuring responsiveness and smooth user interaction. Addressing these limitations provides opportunities for future work, which may include adopting more advanced data management solutions and incorporating interactive features to enhance resident participation and engagement.

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Authors Contribution

Author 1 handled conceptualization, data collection, analysis, and preparation of the initial manuscript draft. Author 2 reviewed the manuscript, added relevant content, and made key revisions to improve clarity and quality after peer review.

Conflict of Interest

The authors have no conflicts of interest to declare.

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