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Requirement and User Modeling for Decision Support System Children Disabilities in Pandemic

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Abstract: - The Covid-19 pandemic is not only felt by parents and children but also by children with special needs. Public Health England reported in 2020-2022, more than 400 per 100 thousand people with disabilities died from Covid-19. Children with special needs or student disabilities receive special attention because they are not like normal children. Children with disabilities cannot do activities like people in general. Children with special needs have several limitations, there are limitations in movement, hearing, seeing, speaking, and several other limitations. This research is used to determine the initial requirements for children with special needs during the Pandemic. Preparing systems such as Technology Collaborative or Decision Support Systems (DSS), a place with the support of a Red Zone Location is an anticipation for children's activities in the environment when dangerous conditions occur during the Pandemic.
The requirement-capturing Analysis process is crucial because it determines what is needed in this research. Requirement Capturing is very important before heading to the process of making technology or DSS. Requirement Capturing includes the process of user requirements and capturing user modeling. The User Modeling process will be carried out. In this research, Requirement Capturing and User Modeling includes Making User requirements, Initial use case diagrams to processes, activity diagrams, and other user modeling according to the capturing process.

Keywords: Requirement Capturing, User Modeling, Children with Disabilities, Decision Support System, Artificial Intelligence

I. INTRODUCTION

The pandemic is one of the nightmares for the entire world community. It is a surprising thing when activities are stopped, and we cannot move normally. The world is seeing a rapid spread of the coronavirus (COVID-19) pandemic, which began in early 2020, and each country is having to build more hospitals to handle the epidemic [1]. In addition, medical services for known hospitals must be examined since they relate to children with special needs to understand the type of health care they need [2]. Over 91% of people either experience no symptoms at all or very mild ones. Between the time an illness manifests and its diagnosis, it takes an average of two days (0–42 days). The epidemic started with a rapid rise in circumstances, which was followed by a gradual but steady fall. Wuhan City and Hubei Province's adjacent provinces experienced a rapid spread of the disease over time.

Of all the regions, Hubei Province has the highest rate of infections among youth. Based on these cases, it was determined that there is no discernible gender difference in COVID-19 susceptibility in children of all ages [3]. These findings also support the theory that kids with special needs are more susceptible than typical kids. Nonetheless, there are still certain issues that need to be addressed by all governments globally, like inadequate healthcare, inadequate care, and unhygienic living conditions [4]. According to data from Public Health England, 451 out of 100,000 individuals with impairments passed away from COVID-19 in 2020 [15] [16].

Children with disabilities have been severely harmed by the COVID-19 pandemic. Children with disabilities find it challenging to receive the therapy and attention they require because rehabilitation clinics have closed as a result of the pandemic [22]. Caregivers have also had difficulties in juggling many families and helping disabled children get used to scheduling changes [22]. Still, there has been psychological and emotional stress on disabled children. Understanding how the pandemic lockdown [5-8] has affected the disability of these children and their families, as well as looking for practical solutions, is crucial [22] [23]. Research and data collection are needed to emphasize the experiences of children with disabilities during the pandemic, to support the provision of various services both now and in the future, and to direct the development of solutions [23].

The COVID-19 pandemic has significantly impacted children with disabilities. Due to the pandemic, rehabilitation centers have closed, making it difficult for children with impairments to get the therapy and care they

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need [22]. In addition, caregivers have had challenges managing families and assisting children with disabilities in adjusting to changing schedules [22]. Nevertheless, children with disabilities have experienced psychological and emotional strain. It's critical to comprehend the effects of the pandemic lockdown on these kids' disabilities and their families while also searching for workable answers [22] [23]. To highlight the experiences of children with disabilities during the epidemic, to promote the availability of various services both now and in the future, and to guide the development of interventions, research, and data gathering are required [23]. It's crucial to think about the security and welfare of children with disabilities during a pandemic since they could be more susceptible to certain dangers [23]. The following things need attention and can be called red zone areas or dangerous locations: crowded spaces with inadequate ventilation. Viral transmission is more likely in crowded indoor environments with insufficient ventilation. During a pandemic [10][14], it is imperative to consider the safety and well-being of children with disabilities as they may be particularly vulnerable to specific threats [23]. Red zone places, often known as risky spots, are regions that require attention are often packed, and have poor ventilation. It is more probable for viruses to spread in crowded indoor spaces with inadequate ventilation [11-14].

This research is used to determine the initial requirements for children with special needs during the Pandemic. Preparing systems such as Technology or Decision Support Systems (DSS) [31-34], a place with the support of a Red Zone Location is an anticipation for children's activities in the environment when dangerous conditions occur during the Pandemic [15-18]. The requirement-capturing Analysis process is crucial because it determines what is needed in this research. Requirement Capturing is very important before heading to the process of making technology or DSS. Requirement Capturing includes the process of user requirements and capturing user modeling. The User Modeling [28-29] process will be carried out. In this research, Requirement Capturing and User, Modeling include Making User requirements, Initial use case diagrams to processes, activity diagrams, and other user modeling according to the capturing process [19-20].

II. REQUIREMENT CAPTURING

Requirement gathering or requirements capturing, is a crucial phase in software engineering and technology development processes [24-27], especially when developing a program focused on children with disabilities during a pandemic. This stage involves several people or parties not only from the side of children with special needs [28-31] but also people who are directly involved such as educators, society, or communities. Requirement capturing is needed to know in detail what is needed. UML (Unified Modeling Language) [12][19], and table Requirements are used during this research process.

A. Analysis of System Requirements (Functional Requirements)

This section describes the functional and non-functional requirements of the software. The list of needs is outlined in tabulation form. System design is implemented using the Unified Modeling Language (UML) in which there are Use Case diagrams, use case diagram descriptions, and activity diagrams with the Entity Relationship Diagram (ERD) database. Creating a user interface using some programming language example: UI UX programming language.

Software functional requirements are the needs for the functions and utilities of the software to be created. With functional requirements, you can see what the software can do. The following is the description used in the needs description table (shown in Table 1 to Table 2).

1) ReqID: each requirement has a unique ID

• First character: 'F' or 'N' (functional or non-functional)

• Second character group: 2 letters for category 'GR' for General Requirements, 'PR' for

• Platform needs, 'MN' for data management needs, 'TM' for transaction needs.

Example: FGR01, FPR01.

2) Description, each need has a description that can be measured.

3) Priority, each need has a priority, and 'MUST' is a requirement that is implemented. The requirement of 'OPTIONS' will only be implemented if time complies.

4) Search Use Case/comments: the search column helps to map the needs in the Use Case (requirements specification)

Software functional requirements (SFR) clarify the direction of the system and the needs that will be used and built. It aids researchers in comprehending the precise objectives, duties, and difficulties that the software must

overcome. This is crucial for a project like a children's disability program because the needs can be intricate and highly customized. By interacting with stakeholders, the project is guaranteed to be user-centered, which lowers the possibility of creating software lacking essential features.

Table 1. General Requirements

Req ID	Description	Priority
FGR01	Requires a login process when the user interacts with the system.	MUST

Table 2. Platform Requirements

Req ID	Description	Priority
FPR01	The server uses the Windows 10 operating system.	CHOICE
FPR02	The database uses MySQL or Microsoft Access.	CHOICE
FPR03	Using the Python, VB.NET	CHOICE

Table 3. Functional Requirements

Req ID	Description	Priority	Use Case Id / Comment
FLA01	The application displays a Login Form to validate system users.	MUST	UCLA01
FMN01	The application displays a user login management form to process data that is entitled to interact with the application.	MUST	UCMN01
FMN02	The application displays the Children's disability data management form (MO) to process data.	MUST	UCMN02
FMN 03	The application displays a data management form to process appraiser data.	MUST	UCMN03
FTM01	The application displays the Children's disability data assessment transaction for processing Children's disability data profile data.	MUST	UCTM01
FTM02	The application displays the MO assessment data management form to process Children's disability data assessment data using the profile matching and Promethee methods.	MUST	UCTM02

B. Non-Functional Requirements

Non-functional is needed in Requirement Capturing because it is related to performance, usability, security, scalability, and others. They are necessary for requirement capture.

- Performance: When utilizing assistive technologies, the application needs to be quick and responsive.
- Security and Privacy: Data protection laws require that sensitive information, such as medical doctor conditions, be stored securely.
- Usability: Testing for usability is essential. It must be simple for kids, parents, and other caregivers to utilize the program.
- Scalability: The system must be adaptable to new kinds of impairments or treatment philosophies.
- Availability and Reliability: The software needs to be dependable with little downtime, especially for therapy programs that may need to be used frequently.

The following describes the non-functional requirements of the software, the purpose of these non-functional requirements is to establish conditions that are important to support normal software operations in Table 4.

Table 4. Non-Functional Requirements

Req ID	Name	Description	Priority
N01	Performance	Sooner or later the application opens a connection to the database and displays it to the application.	CHOICE
N02	Performance	The type of computer used.	CHOICE

C. Creating Use Cases

Making use cases aims to describe the behavior of the system against the functions that must be provided. The first step is to identify the actors involved, the second is to define the use cases for each actor and the last is to model the event scenarios for each use case. Actors represent people or objects that will interact with the application. This application defines one (can be one or many) actors who will interact with the application, namely admin/user. Shown in Table 5.

Table 5. Actors in the DSS Modelling

Actor Name	Definition
Admin	Admin able to perform login data management (include add, edit, delete), children disability data management (include add, edit, delete), data management (include add, edit, delete), Children's disability data assessment data management (include add, edit, delete), and assessment data management with methods (include add, edit, delete print reports. And do everything in the system without restrictions.
Expert, Decision Maker	The user can perform login data management (include add, edit, delete), children's disability data assessment data management (include add, edit, delete), and assessment data management with methods (include add, edit, delete print reports.
Children	Users can view the Decision Support System.

III. THE MAIN PROCESS OF APPLICATION AND MODELING

A. Main Process of Application

1) Login user/users

This function is used to validate user data that enters the system so that only users who already have an account can interact with the system. The system will display the main page if the username and password are correct, and the user can use the system.

2) Management of user login data

This function is used to manage user data, namely encoding the user code, username, password, and user status. With this function, it is possible to obtain user data that has the right to access the system and user access rights.

3) Children's disability data management

This function is used to manage Children's disability data.

4) user data management

This function is used to manage data user

5) Children's disability data value data management

This function is used to manage Children's Disabilities assessment data. With this function, Children's Disabilities profile value data will be obtained through the specified provisions.

6) Children's disability data with the Promethee Method and Profile Matching This function is used to manage Children's disability data assessment data

7) Reports

This function is used to display and print reports. With this function, a report will be obtained.

B. Use Case Diagrams User for Login

Use case diagram for a Student Disability Management System visualizes the interactions between different users (actors) and the system. The goal of this system could be to support students with disabilities by providing accessible tools DSS, and other support services.

In the use case diagram, the system at the center is surrounded by the actors (students, administrators, parents, decision-makers, etc.) who interact with it. Each actor is connected to their relevant use cases, which are represented by ovals.

Example Description:

- The student interacts with the system to access information or entry data and provide feedback.
- The Administrator oversees the system, managing profiles, ensuring compliance, and generating reports.
- Support Staff schedule services and provide updates on student needs.

On Use Cases The application of the Student Disability Decision Support System is shown in Figure 1. and Figure 2.

- Use Case Diagram Admin or User for Login :

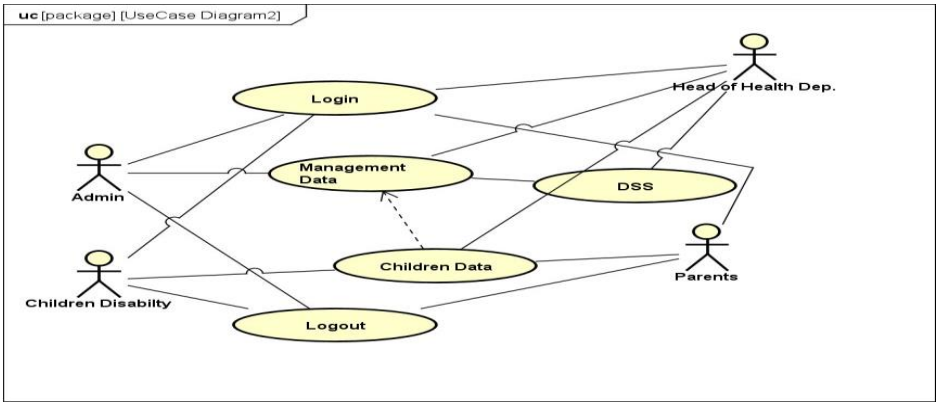


Figure 1. Use Case DSS

- Use Case Diagram Admin or User for Login

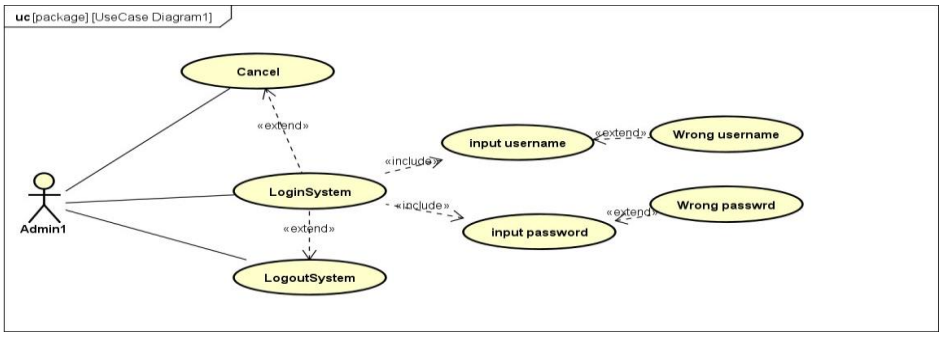


Figure 2. Use Case Diagram Admin / User Login

Description of Use Case Diagram Admin or User for Login in Figure 2:

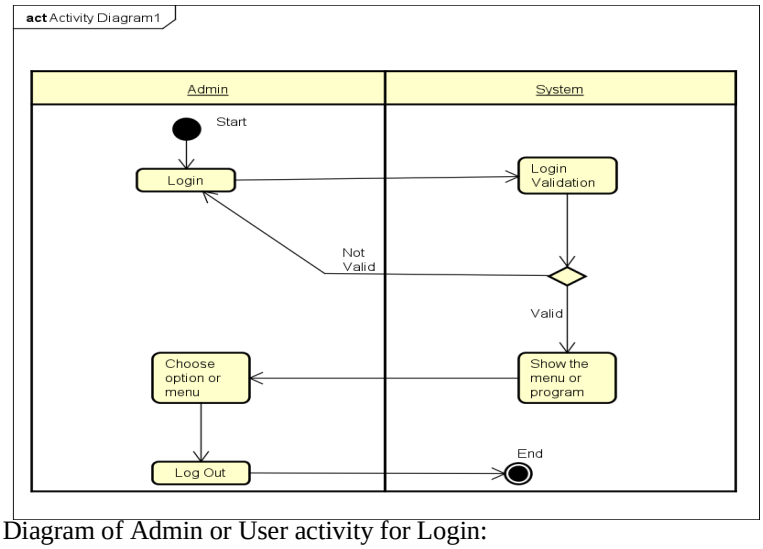
For Use Case Login, admin or user who inputs username and password. If the username and password are valid, then the system will display the main page and if the username and password are not valid, the system will be a member display a message indicating that the username and password are invalid. The description of this Use Case diagram is explained in Table 3.7 Use Case Login Description Form admin.

Table 6. Form Description Use Case Login Admin / User

Use Case Name	**Login Admin**	**ID**	**UCLA01**	**Importance Level**	**Normal**
Primary Actor	users: Administrators/ Users	type	Primary		
Stakeholders and Interests	User: input username and password System: validating username and password				
Brief description	The user logs in by entering the username and password, and then the system responds by validating the input from the user.				
Triggers	Users access the system by entering their username and password and pressing the Login button.				
Relationships	Association: Users System Includes: username, password System Extend Cancel, Exit, Wrong Username, Wrong Password.				
Normal flow events	Login Admin access to the system Admin logs in by entering username and password Admin presses the Login button The system responds to input from the user and validates the input. The system matches the username and password of users on the database 7. The system sends a return value if it is successful and valid then the system displays the main page. If invalid then displays a message that the username and password are invalid.				
Alternate/exception flows.	1. If the user does not fill in the username and password the system will respond by returning a null value or no display changes on the login page. 2. If the user enters the wrong username or password, the system will issue a message "Error login please try again". 3. Press the cancel button and the system will display a message to exit the system.				
Preconditions					
Postcondition	ge				

B. Activity Diagrams User for Login

Activity Diagram Admin or User for Login helps to know the direction of the admin or user process in logging into the system from start to finish. The process in detail will be explained in the Activity Diagram Admin.



Description Activity Diagram of Admin or User activity for Login:

Figure 3. shows the login flow activity carried out by the admin/user. Admin/user login and the system responds by validating the login to match the login. If it is valid then the system will display the main page, if it is not valid then the system will give a message that the username and password are invalid. After finishing using the system, the admin will log out.

C. Sequence Diagrams User for Login

Sequence Diagram Admin or User for Login to find out what is involved in the login process and what activities occur. Sequence Diagram Login Data Management also captures processes such as displaying data, editing data, deleting, etc.

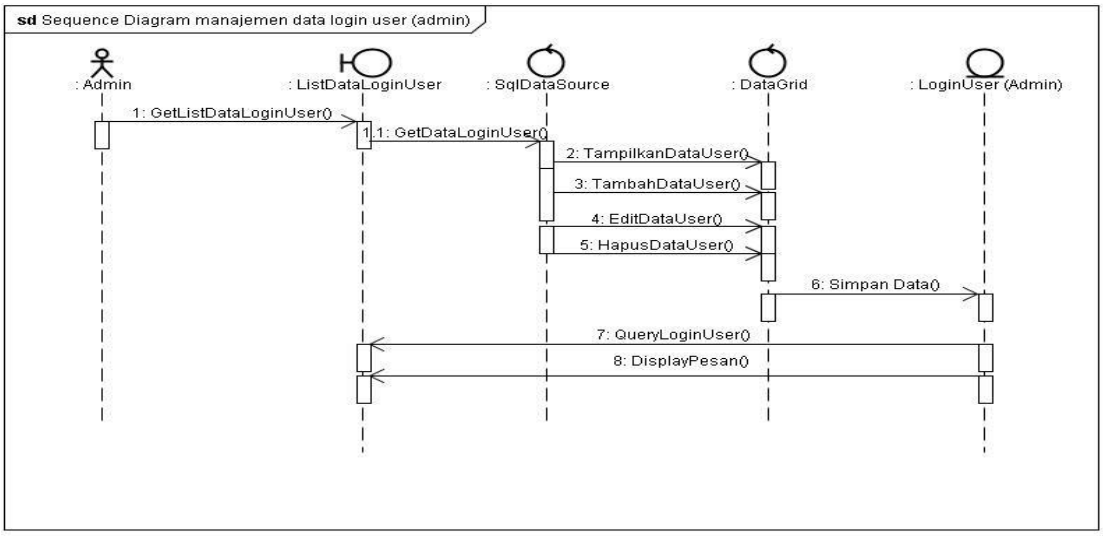


Figure 4. *Sequence Diagram* Admin or *User* for *Login*

Description of Admin or User Sequence Diagram for Login:
In Figure 3.7, the sequence diagram of the admin or user goes to the Login page by entering the username and password and then interacts with the admin data boundary class to determine whether the username and password data are valid or not. If the data is valid, the system can save data and send query saving to the system and the system shows information about the Display Message.

C. Management Data Student Disability

a. Use Case Diagram Admin for Student Disability

Use case diagram for a Student Disability visualizes the interactions between admin as actors and the system. The goal of this system could be to support students with disabilities by providing accessible tools DSS, and other support services.

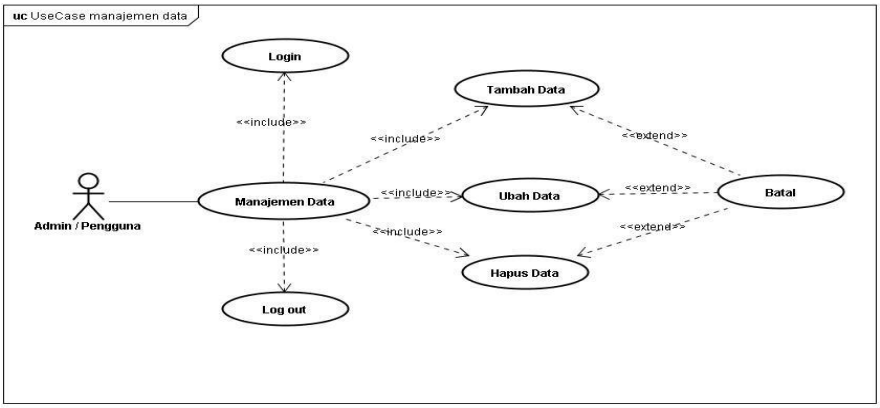


Figure 4. *Use Case Diagram* Admin for Management Children's Disability

Description of Admin Use Case Diagram for Student Disability Data Management:

Figure 4 above illustrates the admin Use Case diagram for Student Disability data management. Admin can add Student Disability data to be added to Student Disability data, then admin can add Student Disability data, change Student Disability data, delete Student Disability data. Admin is also required to log in first before making changes to Student Disability data. After making changes to the data, the admin logs out. The description of this Use Case diagram is explained in the Student Disability Data Management Use Case Description Form in Table 3.

Table 3. Student Disability Data Management Use Case

Use Case Name	**Management Data *Student Disability***	***ID***	**UCMN01**	***Importance Level***	**Very Importance**
Primary Actor	*User*: Admin	*Type*	Primer		
Stakeholder and Interest	User: manages Student Disability data, starting from adding Student Disability data, changing Student Disability data, deleting Student Disability data, and retrieving Student Disability data. System: validates Student Disability data management.				
Brief description	The user adds Student Disability data, changes Student Disability data, deletes Student Disability data, and then the system responds by validating the input from the User.				
Trigger	Users want to use the system by adding Student Disability data, changing Student Disability data, deleting Student Disability data, and retrieving Student Disability data.				
Relationship	Association: User System Include: Add Data, Change Data, Delete Data. System Extend: Cancel.				
Normal flow event	User logs in 2. User adds Student Disability data, changes Student Disability data, deletes Student Disability data, and retrieves Student Disability data. 3. The system responds to data addition, data changes, data deletion, Student Disability data retrieval, and Student Disability data, and validates user changes. The user logs out.				
Alternate/ exception flow	Press the cancel button and the system will display a message to not make changes to the system.				
Precondition	Main Menu				
Postcondition	Data *Student Disability*				

b. Activity Diagram Admin for Management Data Student Disability

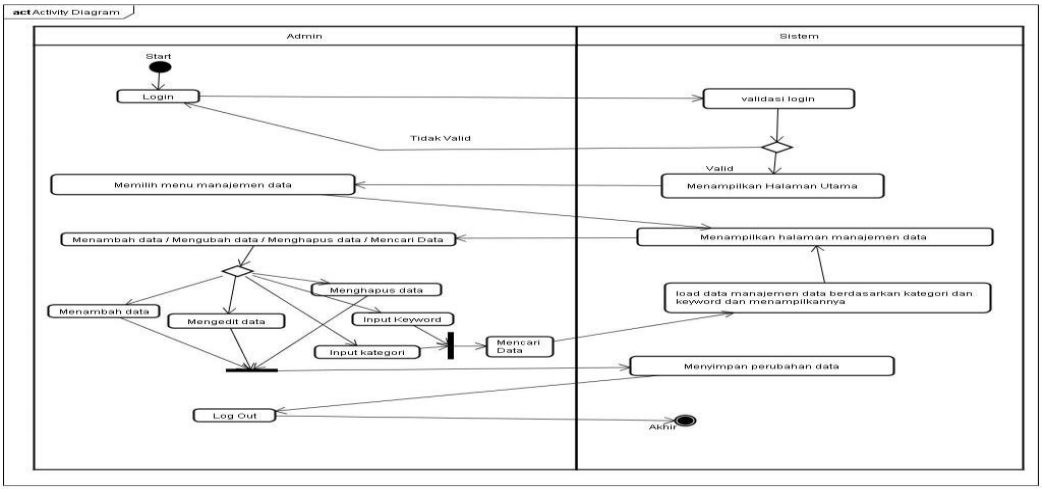


Figure 5. *Activity Diagram Admin* Management Data *Children Disability*

Description of the Admin activity diagram for Student Disability Data Management:

Figure 5. shows the admin flow activity for Student Disability data management. The admin logs in and the system responds by validating the login to match the login. After logging in, the system displays the main menu to the admin, then the admin selects the Student Disability data management menu. The admin will add data, change data, delete data, search for data and the system will save the data changes. After finishing, the admin logs out.

If the admin chooses to add data management data, it will go to the add data activity. If the admin chooses to change the Student Disability data management data, it will go to the change data activity and the system will save the Student Disability data changes, if the admin chooses to delete the Student Disability data management data, it will go to the delete Student Disability data management data activity and the system will save the Student Disability data changes, if the admin chooses to search for Student Disability data management data, it will go to the Student Disability data management data search activity. After completion, the admin logs out and the system will end the activities that have been carried out by the admin in adding Student Disability data management data [30-32], changing Student Disability data management data, deleting Student Disability data management, or searching for Student Disability data management data.

Data changes will be saved in Data Management if changes occur, changes due to editing, or the addition of data that allows for new information, reduced information, or additional information so that the results of the latest changes will be saved in the Database or Database Management System (DBMS).

c. Sequence Diagram Admin for Management Data Student Disability

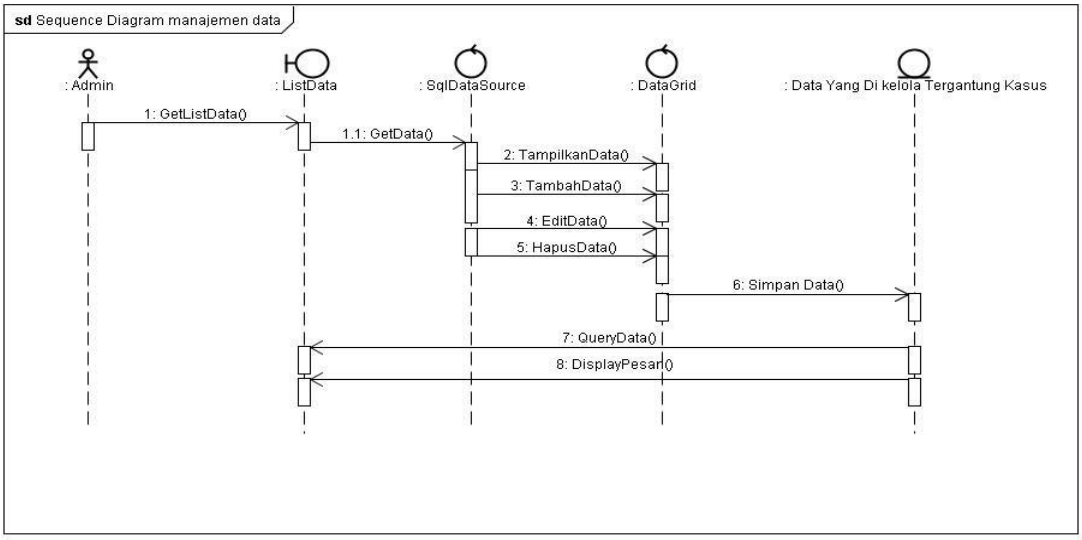


Figure 6. *Sequence Diagram Admin* Management Data *Student Disability*

Description of Admin Sequence Diagram for Student Disability Data Management:
In the sequence diagram (Figure 6.) above, the admin or user interacts with the Student Disability data management boundary class, then retrieves Student Disability data in the database and goes to the Student Disability data management class. In the SQL Data Source, commands are given such as adding Student Disability data management data, changing Student Disability data management data, and deleting Student Disability data management data [29-32].
Data changes will be saved in Data Management if changes occur, changes due to editing, or the addition of data that allows for new information, reduced information, or additional information so that the results of the latest changes will be saved in the Database or Database Management System (DBMS).

D. Modeling Red Zone Location and Children Disabilities

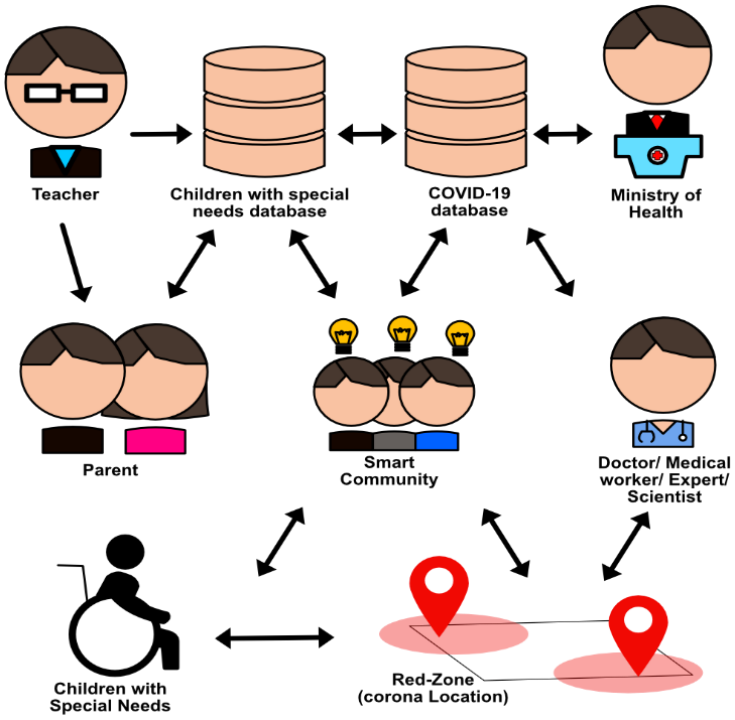


Figure 7. Model Proposed Technology Collaboration [19]

Figure 7 illustrates the first flow, which entails identifying children with special needs at the Red Zone location [19] as soon as possible using information gathered by the Smart Community or information from parents and teachers linked to specially developed applications and collaborative technology support systems.

If necessary, information from parents or instructors can be updated at any moment. This aids in the evacuation of special needs children when necessary. In addition, parents and instructors contribute data relating to the sort of child with special needs. Schools, parents, and children with special needs who require this assistance are aware of the location of the red zone. However, professionals in the medical field process data precisely and instantly based on the location of the red zone in each area. They also need to know how many COVID-19-positive and negative from the Red Zone site have been confirmed.

IV. Conclusions

In this study, we conducted the requirement and user modeling process with the Unified Modeling Language (UML) for Children with Disabilities in COVID-19 Areas with Artificial Intelligence and Pervasive Computing. The requirement-capturing Analysis process is crucial because it determines what is needed in this research. Requirement Capturing is very important before heading to the process of making technology or DSS. Requirement Capturing includes the process of user requirements and capturing user modeling. The User Modeling process will be carried out. In this research, Requirement Capturing and User Modeling includes Making User requirements, Initial use case diagrams to processes, activity diagrams, and other user modeling according to the capturing process.

Several users can be selected for user access rights. The user type with admin can do login access rights to carry out the data management activity process. The next type of user is an expert/scientist or decision maker to accesses data management to carry out the process of selecting decisions that are appropriate for children with special needs according to the criteria or parameters required.

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