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System of stunting information centre development using waterfall method

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ABSTRACT

Stunting is a condition in which the development and growth of children are stunted due to malnutrition. In Indonesia, 21.6% of the approximately 300 million stunting cases still exist. In an endeavour to combat stunting, the Indonesian government is holding posyandu at the lowest levels of government. Despite these efforts, a significant number of parents do not receive information about stunting. Therefore, this study will develop a web-based information application about stunting. The application is developed using the cascade methodology. The conclusion of this analysis was that the waterfall methodology is still applicable for small development teams. The application can then provide information on child development and malnutrition at any time.

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1. INTRODUCTION

Nutrition is the key point for children's development, especially in the golden period, or the first thousand days. In the golden period, a child will grow rapidly. A child needs maximal nutrition (Budge et al., 2019; Molenaar et al., 2023). A stunting case was caused by malnutrition during this period. Even though the World Health Organization (WHO) already provides a standard of nutrition for children(WHO Team, 2014), The cases of stunting are still high and have become an important issue (Leroy & Frongillo, 2019; Vaivada et al., 2020). The researchers are still conducting the investigation about preventing stunting because stunting will cause a delay in cognitive development and a fatal disease (De Sanctis et al., 2021). Stunting can be caused by several things: lack of nutrition during pregnancy, slow fetus growth, lack of breast milk (ASI) intake in the first six months, late introduction of complementary foods (MPASI), and failure to absorb nutrients due to disease (Ariani, 2020; Ernawati, 2020; Komalasari et al., 2020; Ulfah & Nugroho, 2020; Yanti et al., 2020).

Stunting conditions can be found in developed countries, including Indonesia. Based on the data, there are 21.6% of stunting cases in Indonesia, compared to 314 million stunting cases around the world (Rokom, 2023). The number of stunting cases shows that the parents in Indonesia did not care about giving their children proper nutrition during their growth (Hamzah & B, 2020; Rahmadhita, 2020; Sairah et al., 2023). Besides, the parents did not know about the importance of balanced nutrition. Information is the key to preventing stunting (Anwar et al., 2022; Efendy & Setiawan, 2021; Olo et al., 2020; Sairah et al., 2023).

Socialization of stunting prevention in Indonesia is often carried out, both by the Ministry of Community Affairs and academics. Socialization is carried out by various elements of society, starting with parents, couples who are getting married, and teenagers (Atasasih, 2022; Metasari et al., 2022; Rahmawati et al., 2020; Umam et al., 2022; Widyastuti et al., 2022). Furthermore, the

government also held Posyandu at the lowest level of government in an effort to overcome the stunting. Despite the various efforts that have been made, information on stunting and its prevention is still often not conveyed. This is due to several reasons that posyandu and socialization cannot be carried out all the time.

Several studies state that a web-based information system can disseminate health information (Kurniawan & Sani, 2019; Kusuma et al., 2019; Tohirin & Widianto, 2020). Furthermore, the system has the advantage that users can access information anytime and anywhere. Therefore, this research has designed and built a web-based information system for child stunting conditions. System development adopt the waterfall method because the team does not have more resources to develop the system, and this method is suitable to be applied to the team's conditions when compared to other methods. The research on developing system of stunting information have the implications of digitalizing posyandu environment. Besides, the system minimize the risk of losing data possibility. The article will be divided into several sections as follows: (1) Introduction; (2) Research Methodology; (3) Results and Discussion; (4) Conclusion; and (5) Bibliography.

2. RESEARCH METHOD

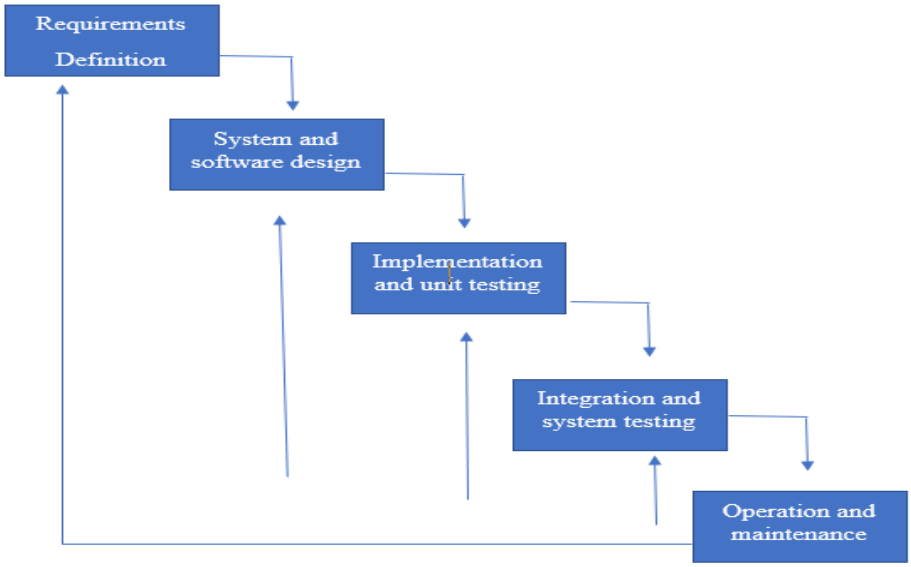

Figure 1. The flow of system development

Figure 1 depicts information from this research stage. The research implements the waterfall method in building applications. The stages of this research start with determining application requirements, designing the application, implementing it into program code, testing the application, and maintenance. The results of each stage will be explained in the results and discussion section.

3. RESULTS AND DISCUSSIONS

In the first stage of this research, the author collected data. The data collected is in the form of stunting information and nutritional recommendations. The author collected data based on the Mother and Child book, which was given to babies and mothers after giving birth. The book has sufficient information and has been verified by the Ministry of Health. Apart from that, the author conducted a survey of user needs for the system to be built. The Sawangan village of Posyandu is the user of the system being built.

System and Software Design

The second stage of this research is the design stage. For the design, UML modeling will be carried out, consisting of use case diagrams, activity diagrams, sequence diagrams, and class diagrams. Apart from that, the database design created was an entity relationship diagram and relationships between tables.

Figure 2 presents the use case of the system being built. The use case represents the features that can be used in the system. In Figure 1, the system has three user accesses, namely admin, doctor, and end user. The admin is tasked with processing data on the system, while doctors are only given access to respond to forums from end users. End users can monitor the baby's growth through the system, which will make it easier for end users to know the baby's growth and development.

Figure 2. Use case

In figure 3, there is an activity diagram designed to display a graph of baby growth and development. The activity starts with the end user selecting the data menu in the application, and then the application will request data from the database. The next step is to return the results of the data request to the application. Based on the results of the request, a graph of the baby's growth and development will be presented to the end user via the application.

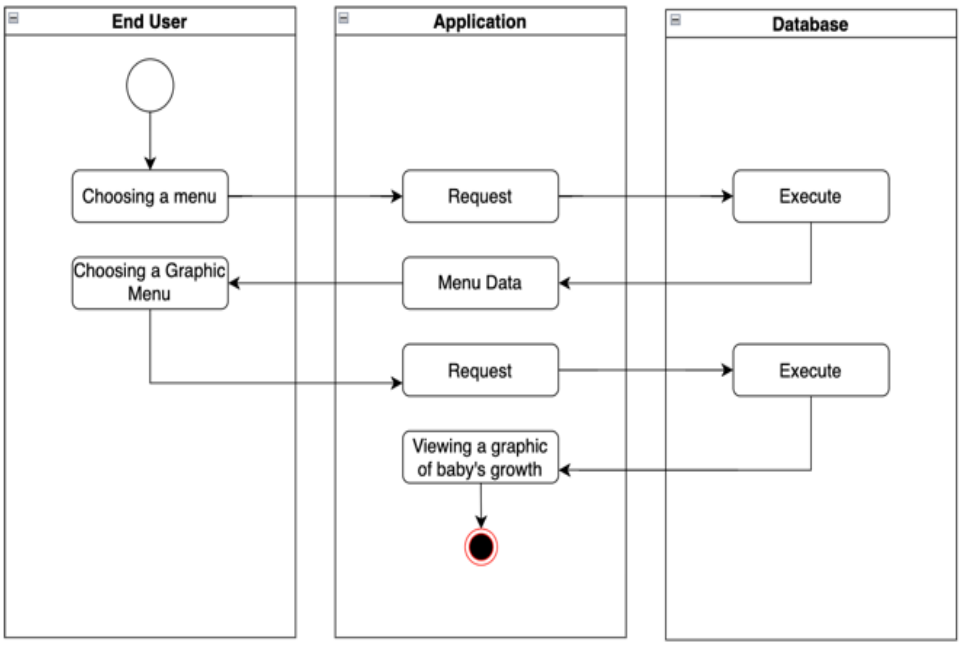

Figure 3. Activity diagram

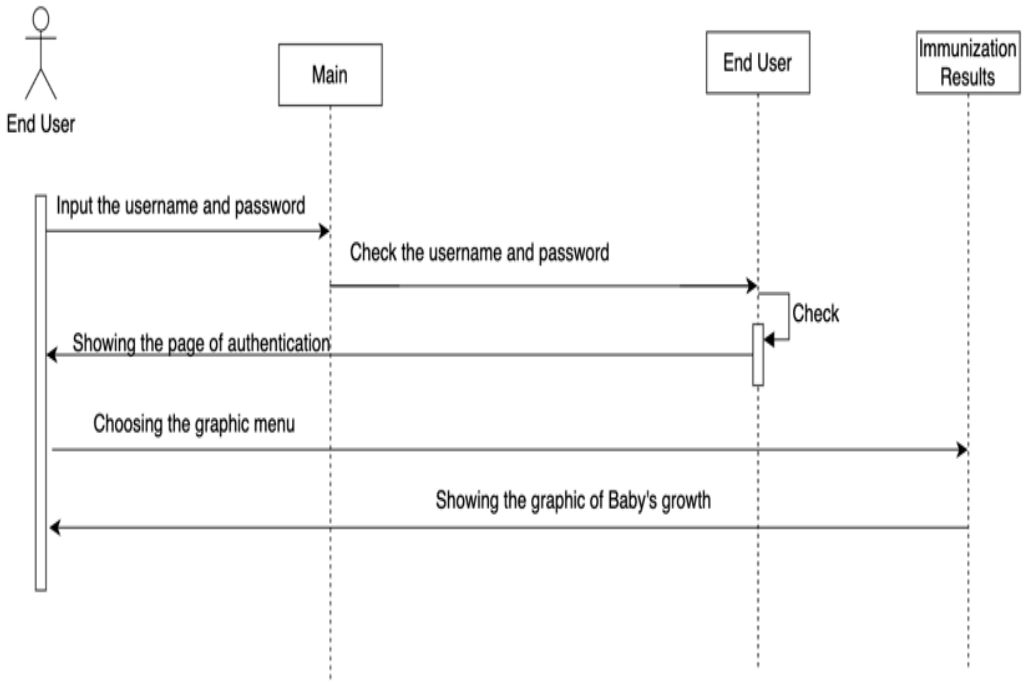

Figure 4. Sequence diagram

Figure 4 is a design of the sequence diagram. Based on the sequence diagram, we will find out the detailed process of an application feature. Figure 4 illustrates the process that occurs when the end user wants to display graphic data on baby growth and development. The next design at this stage is a database design. The database will be designed based on class diagrams and entity relationship diagrams (ERD) and Figure 5 presents the class diagram design.

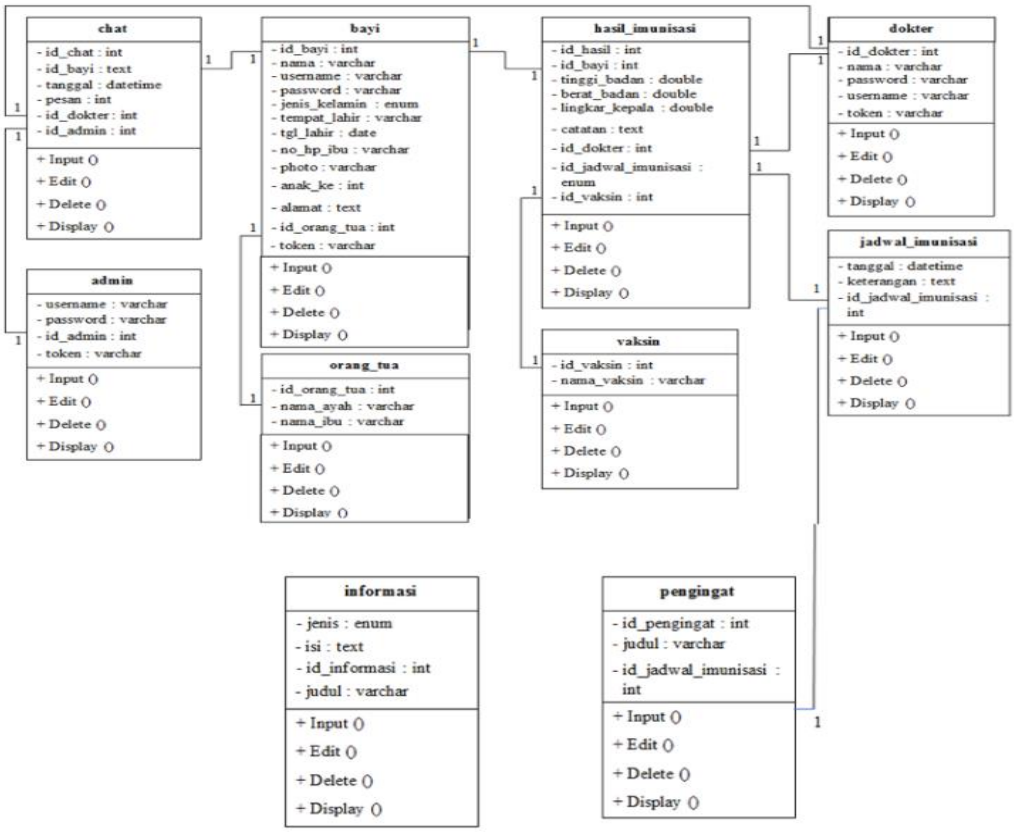

Figure 5. Class diagram

Implementation and Unit Testing

The next stage is implementation and unit testing. At this stage, the existing design will be used as a reference for writing program code. Figure 7 is the result of one of the features, namely showing child graphic data. Lines of code are written in PHP and HTML programming languages, while CSS is used as a framework for application display.

```
<!-- page content -->
<div class="right_col" role="main" style="min-height: 722px;">
  <div class>
    <div class="page-title">…</div>
    <div class="clearfix">…</div>
    <div class="row">
      ::before
      <div class="col-md-12 col-sm-12 col-xs-12">
        <div class="x_panel">
          <div class="x_content">
            <form id="demo-form2" class="form-horizontal form-label-left" method="post" action="?page=grafik">
              <div class="form-group">
                ::before
                <label class="control-label col-md-2 col-sm-2 col-xs-6" for="last-name">Bayi </label>
                <div class="col-md-5 col-sm-5 col-xs-12">…</div>
                <div class="col-md-1 col-sm-1 col-xs-4">
                  <button type="submit" class="btn btn-primary">Lihat Grafik</button>
                </div>
                ::after
              </div>
              ::after
            </form>
            <!--<button onclick="cetak()" class="btn btn-primary">Print Grafik</button>-->
            <div id="printable">…</div>
            <iframe src style="display: none" name="frame" id="frame">…</iframe>
          </div>
        </div>
      </div>
    </div>
```

Figure 6. Program code

Integration and System Testing

The next stage is the integration or implementation of the code parts that have been created and then made into a unified application. Figure 8 is the result of implementing a program that displays baby data graphs. Apart from that, at this stage, every functionality of the existing application will be tested. Table 1 presents the test results of all application functions. Testing uses the black box method, which will check every application's functionality.

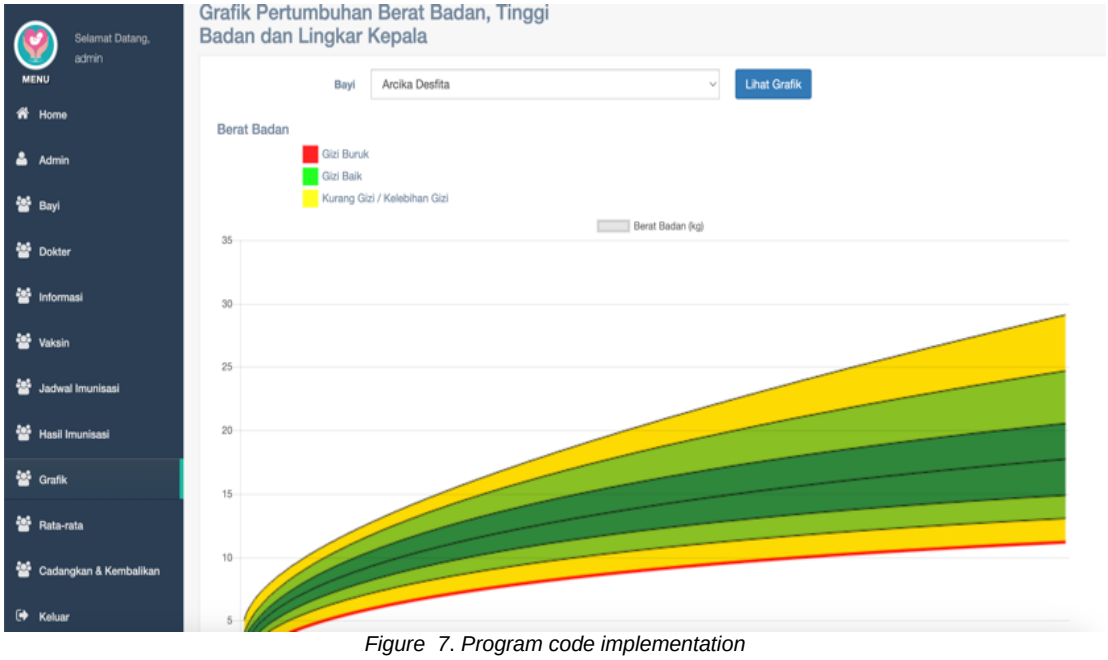

Figure 7. Program code implementation

Table 1. Blacbox testing

No.	Information	Testing	Results
1.	Login Page	There is a warning if the user enters the username and password incorrectly.	Able
		The system only allows registered users to enter the application.	Able
2.	Main Page	Displays the Baby Profile menu, Reminders, Data, Graphics, Information and Discussion Forums.	Able
3.	Baby profile Page	Able to display a baby data.	Able
4.	Reminder Page	Displays information regarding the nearest immunization schedule reminder.	Able
		Displays information regarding the immunization schedule for the next few months.	Able
5.	Data Page	Displays information regarding development data on body weight, height and head circumference.	Able
		Able to display the history of the baby's development from the first immunization until now.	Able
6.	Graphic Page	Able to display graphs of weight development.	Able
		Able to display graphs of development of height and head circumference.	Able
7.	Information Page	Able to display information about health.	Able
		Able to display information about immunizations.	Able
8.	Discussion Page	Admin can chat.	Able
		Doctors can chat.	Able
		End-user able to chat	Able

Operation and Maintenance

After the implementation and system testing stages, the next step is operation management and application maintenance. In this research, maintenance will be carried out while providing updates according to user requests or the latest information related to stunting.

4. CONCLUSION

The research tried to solve is the availability of stunting information. The output is the web application of stunting. The application was built using a waterfall method, and we can conclude that waterfall method still relevant to use. We contribute to providing child's growth information at Posyandu level. Furthermore, the research gives an insights that waterfall method is still the rigid method for some problems. However, the condition like amount of team and user's request are the conditions if we want to utilize waterfall method. The web application can provide the information about stunting and children development. In the future research, we recommend implementing PhP framework like a Laravel or yii for the systems. Besides, developing an IoT device for measuring the growth and inputting the data automatically.

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