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DECISION SUPPORT AND MONITORING SYSTEMS FOR HUMANITARIAN PROGRAMS USING THE FORWARD CHAINING METHOD

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Abstract— One of the covid-19 pandemic impacts is the emergence of new social problems. Humanitarian agencies are helping the government's role to overcome various social issues that arise through its humanitarian programs. One of which is with the MSR program from Aksi Cepat Tanggap Purwokerto. With increasing social problems and the complexity of improving data collection due to the covid-19 pandemic, the methods' limitations previously using paper will be difficult, and the limits of people who have the expertise to make decisions related to the submission of prospective beneficiaries. A decision support system is needed to provide suggestions of results under the rules that have will determining and monitoring and filing systems to provide convenience in managing data collection.

***Keywords**: Decision support system, forward chaining, humanitarian programs, monitoring.*

Intisari— *Salah satu dampak pandemi covid-19 adalah munculnya masalah sosial baru. Lembaga-lembaga kemanusiaan membantu peran pemerintah untuk mengatasi berbagai persoalan sosial yang muncul melalui program-program kemanusiaannya. Salah satunya dengan program MSR dari Aksi Cepat Tanggap Purwokerto. Dengan semakin meningkatnya permasalahan sosial dan kompleksnya peningkatan pendataan akibat pandemi covid-19, keterbatasan metode yang sebelumnya menggunakan kertas akan menjadi sulit, dan keterbatasan orang yang memiliki keahlian untuk mengambil keputusan terkait pengajuan calon penerima manfaat. Sistem pendukung keputusan diperlukan untuk memberikan saran hasil berdasarkan aturan yang telah ditentukan dan sistem pemantauan dan pengarsipan untuk memberikan kemudahan dalam mengelola pengumpulan data.*

***Kata Kunci**: forward chaining, monitoring, program kemanusiaan, sistem pendukung keputusan.*

INTRODUCTION

Since March 2015, the change of national poverty rates has consistently decreased and shows progress at 9.82% in 2018 [1]. But this trend changed when there was an outbreak of coronavirus, better known as Covid-19, that has hit the world since the end of 2019 and is observed to enter and spread to Indonesia since March 2020, with the number of infected that continues to increase, the implementation of various policies to overcome the spread of the virus continues to be carried out. This resulted in the impact of the community's economic decline and increased the unemployment rate, decreased productivity levels of individuals and companies, and encouraged the emergence of new poor people who will increase the number of poor people [2].

Humanitarian institutions help overcome various social problems that arise through humanitarian programs. ACT (Aksi Cepat Tanggap) is an institution engaged in the field of humanity on a global scale that has reached more than 28 countries (data, March 2, 2020, until August 9, 2021) [3]. One of the ACT programs is a Mobile Social Rescue program, better known as the MSR program, that focuses on providing general assistance to the community with various sub-programs, including pre-prosperity, educational, and toilet facilities renovation assistance, assistance business capital, and contribution of Indonesian teacher friends. This sub-program is a local program that only covers the area that the work area of the ACT Purwokerto branch office.

With increasing social problems and with the complexity of data collection as a result of the covid-19 pandemic [4], the limitations of the methods used previously using paper will be difficult, as well as the limitations of people who have the expertise [5] to make decisions related to the submission of prospective beneficiaries then, a decision support system is needed to be able to

provide results advice by the rules that have been determined and the design—monitoring and submission to providing convenience in managing data collection. A decision support system (DSS) is a solution to solve a particular problem in a structured or unstructured manner [6]. The forward chaining method has been used in research [7] to determine the effect on the dressing skills of moderately mentally disabled children as a way of learning intervention. While research [8] used the forward chaining method in building an application for monitoring the nutritional status of children under five in the Puskesmas 1 Baturraden, Banyumas Regency.

The use of DSS in the social sector has been carried out in several previous studies, but the method used is different from that used in this study. Previous research used the Analytic Hierarchy Process method, which produces alternative criteria and determines priorities in more than one or some data on food recipients for low-income families [9]. Then the research on the decision supporting system of the recipient of the Program Keluarga Harapan (PKH) used the Simple Additive Weighting method that conducted an assessment of any input undertaken by the user based on the condition of the house, economic conditions, and condition of the occupants of the house [10]. Another research built a decision support system using the Weighted Product method to make it easier to determine recipients of assistance with Penyandang Masalah Kesejahteraan Sosial (PMKS) at the Ikatan Pekerja Sosial Masyarakat (IPSM) Kertajaya Village, Surabaya City [11].

MATERIALS AND METHODS

The research methods carried out are divided into several stages:

Identification of problems

Identify existing problems. The issue is to make decisions related to the submission of data received or not received and the management of data and monitoring of the results of the recommendation of the MSR humanitarian program to ACT Purwokerto.

Observation

Observation is a technique or approach that aims to obtain primary data by directly observing the objects [12]. This method is carried out by witnessing how the MSR humanitarian program runs from beginning to end with the Aksi Cepat Tanggap Purwokerto branch office problems.

Study of literature

Conduct research on various literature on forward-chaining methods and CodeIgniter (CI) frameworks. Based on several sources that have been collected, they can be used as a reference to make decisions on the decision support system expected to submit prospective beneficiaries of the ACT Purwokerto humanitarian program.

System Development

This research uses the waterfall model. The waterfall model is sequential software development. The progress is described by flowing down through various phases that must run to build computer software Figure 1 [13]:

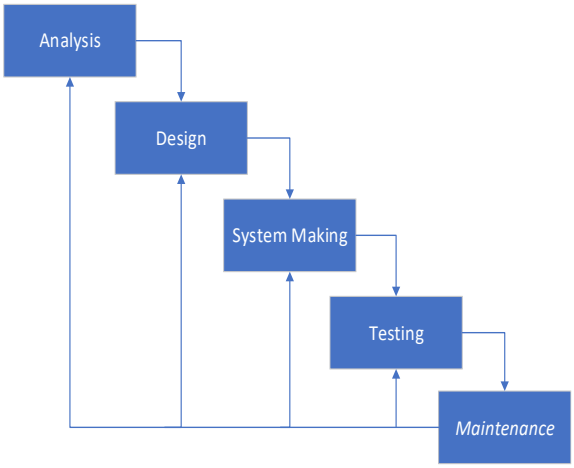

Figure 1. Waterfall Methods

Decision Support System Methods

Forward chaining is a method of searching or drawing a conclusion based on existing data or facts leading to a conclusion. The search starts from the existing facts and then moves forward through the premises to reach a conclusion or bottom-up reasoning [14][15]. The forward chaining method is a method that moves forward through the facts towards the existing conclusions [16]. Figure 2 described that fact 1 and fact 2 can result in a conclusion or decision 1, fact 3 or fact 4 can result in decision 2, and if conclusion 1 and conclusion 2 meet, it will result in conclusion 3:

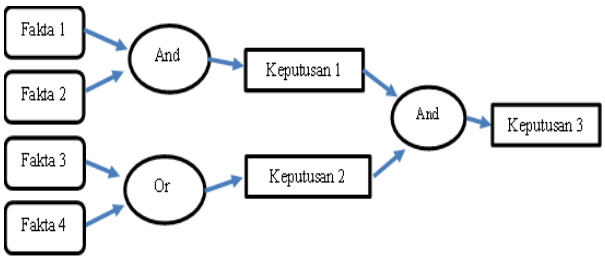

Figure 2. Forward chaining overview

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Data collection

The data used to make decisions on decision support systems is divided into two, namely conclusion or decision data and fact data, decision. data can be seen in table 1, while fact data can be seen in table 2.

Table 1. Decision data

Code	Description	Status
K1	Dikaji Ulang	Dikaji
K2	Ditolak	Ditolak
K3	Bantuan Pendidikan	Diterima
K4	Sahabat Guru Indonesia	Diterima
K5	Bantuan Modal Usaha	Diterima
K6	Renovasi Rumah	Diterima
K7	Renovasi MCK	Diterima
K8	Sumur Wakaf Keluarga	Diterima
K9	Bantuan Prasejahtera	Diterima

Table 2. Fact Data

No	Code	Description
1	F1	diajukan
2	F2	Jenis Pekerjaan : ASN, TNI, POLRI, Dosen, Pegawai BUMN/BUMD
3	F3	Jenis Pekerjaan : ASN, TNI, POLRI, Dosen, Pegawai BUMN/BUMD
4	F4	Jenis Pekerjaan : Pelajar
5	F5	Status Pernikahan : Belum menikah
6	F6	Status dalam keluarga : anak
7	F7	Jumlah anak : 0
8	F8	Biaya Pendidikan anak : >= 350000
9	F9	Jumlah tanggungan >= 200000
10	F10	Bantuan Pemerintah <= 500000
11	F11	Jenis Pekerjaan : Guru
12	F12	Jenis Pekerjaan : Pengajar
13	F13	Jumlah penghasilan : <= 1500000
14	F14	Jenis pekerjaan : Tidak bekerja
15	F15	Kondisi rumah : layak
16	F16	Kondisi MCK : layak
17	F17	Tidak memiliki penghasilan tetap
18	F18	Rata-rata penghasilan : <= 1500000
19	F19	Pemasukan tambahan <= 2000000
20	F20	Kondisi air : Sulit, jika kemarau kering
21	F21	Bantuan Pemerintah <= 500000
22	F22	Bantuan non pemerintah<= 400000
23	F23	Jenis pekerjaan : Wirausaha
24	F24	Memiliki MCK
25	F25	Kondisi rumah : tidak layak
26	F26	Jenis pekerjaan : buruh
27	F27	Tidak memiliki MCK
28	F28	Kondisi MCK tidak layak
29	F29	Jumlah penghasilan <= 100000
30	F30	Pemasukan tambahan <= 800000
31	F31	Bantuan pemerintah <= 300000
32	F32	Bantuan nonpemerintah <= 500000
33	F33	Kondisi rumah : layak
34	F34	Status tanah : pribadi, warisan, keluarga
35	F35	Jenis pekerjaan : swasta
36	F36	Status pernikahan : Menikah atau pernah menikah
37	F37	Status dalam keluarga sebagai suami
38	F38	Memiliki Pekerjaan
39	F39	Jumlah penghasilan <= 1500000
40	F40	Jumlah anak >= 2
41	F41	Jumlah keluarga >= 3
42	F42	Jumlah penghuni rumah >= 3
43	F43	Jumlah anak yang sedang menempuh pendidikan >= 1
44	F44	Biaya pendidikan anak >= 800000
45	F45	Status Tanah: sewa
46	F46	Jumlah kendaraan <= 1

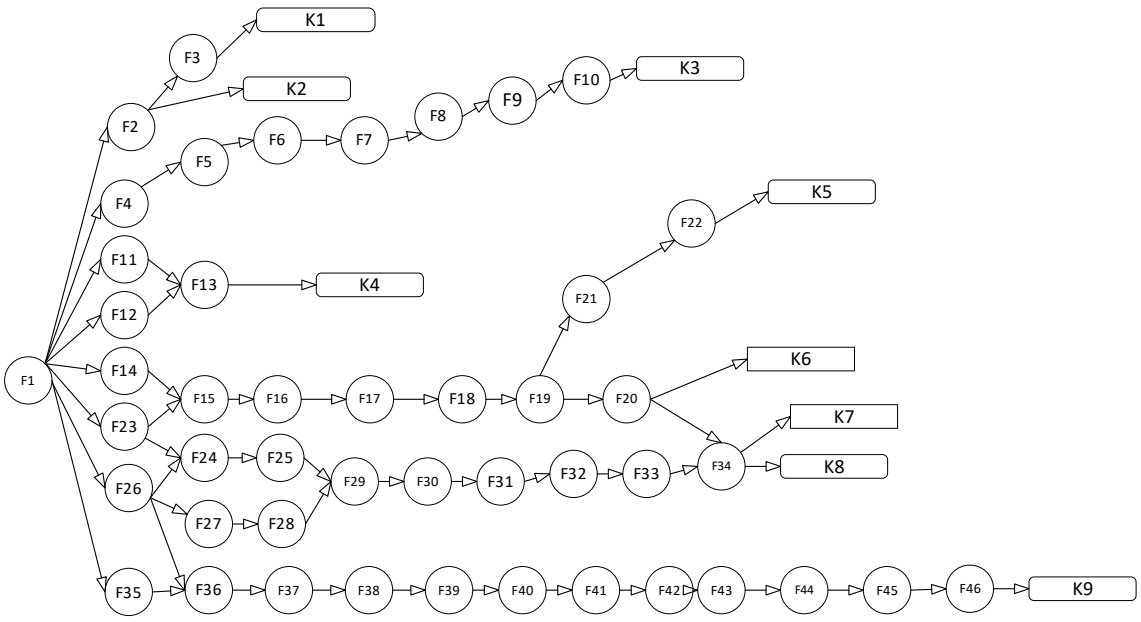

Figure 3. Decision support system rules

To get a conclusion, the existing facts must be accompanied by a rule, by which the data will go through the stages of checking whether the data is under the current rules; this fact will run until the facts can be verified. Conclude to be able to produce a decision that is used by the decision support system, as for the rules of the DSS can be seen in the following figure 3.

RESULTS AND DISCUSSION

Analysis

At this stage, researchers analyzed the problems at the ACT Purwokerto branch office and found several problems related to existing data collection specifically related to the MSR humanitarian program. At this time, manual data collection using the method of writing data into documents in the form of paper that with manual data collection can cause several problems, one of which is the difficulty of managing data when the existing data is more and more, and with documents in the form of paper it has a risk of being lost or damaged. In conducting data collection, there are assessment aspects that must be included in the results document, but only volunteers who have been equipped with the skills and knowledge of assessment can find out. In evaluating the results of the assessment as a parameter of whether or not prospective beneficiaries are accepted, people who have special expertise are needed. The number of beneficiaries of the MSR program is increasing day by day, so it will be a challenge to be able to monitor the pace or progress of each assistance received.

The solution to dealing with these problems is to use technology in the form of a website as a means to be able to manage the MSR humanitarian program at the ACT Purwokerto branch office.

Design

1. Use Case Diagram

A use case diagram for DSS application and monitoring consists of 2 actors, namely user, and admin with 14 use cases that actors can carry out. Each role or user access rights are different. User actors are restricted in accessing some of the website's existing features, and the admin actor can access all current features. The definition of actors can be seen in Table 3 below and the use case diagram in Figure 4:

Table 3. Actor Definition

Actor Definition		
No	**Actor**	**Description**
1	Admin	Actors that can interact with all monitoring and SPK application features
2	*User*	Actors can only interact with some features/access restricted to the app.

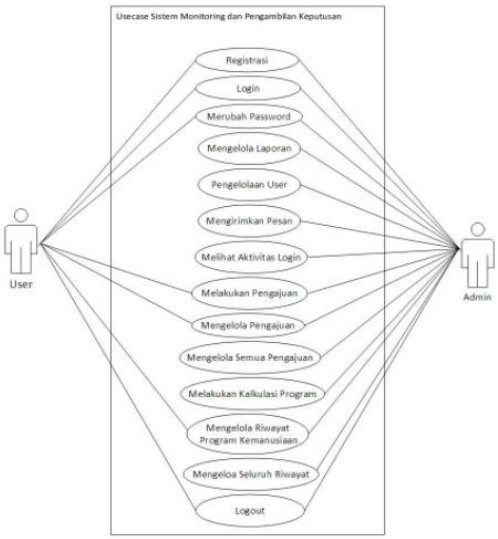

Figure 4. Use case diagram

2. Class Diagram

At this stage, describing the structure that shows classes and their relationship to each other in the website monitoring model and decision support system for the MSR humanitarian program at the ACT Purwokerto branch office, the class diagram can be seen in Figure 5.

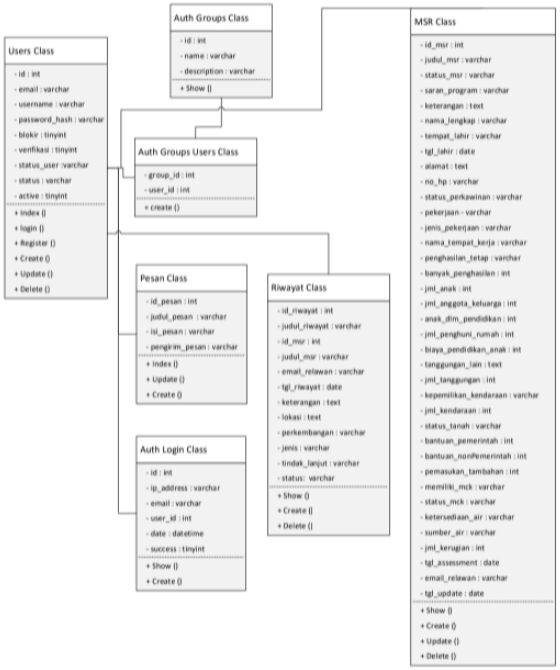

Figure 5. Class diagram

3. Design Concept

Design concepts are created to design software to be able to make it easier when the app will be continued in the implementation stage or application development and become a reference in the manufacturing stage. Making the design concept

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refers to the application requirements in terms of display or UI and becomes the initial part that bridges the user with the system; the design concept can be seen in Figure 6, Figure 7, Figure 8, and Figure 9.

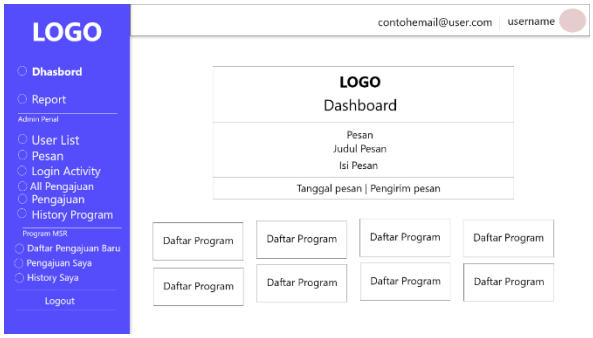

Figure 6. Dashboard Page

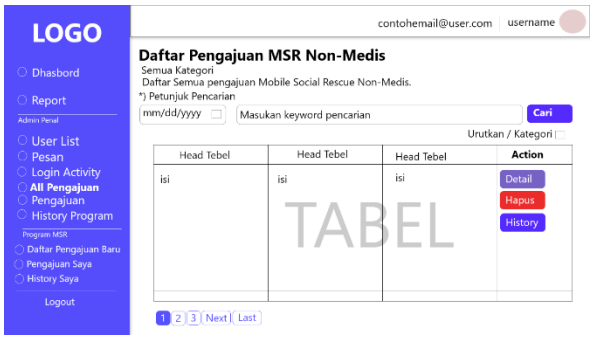

Figure 7. Submission List Page

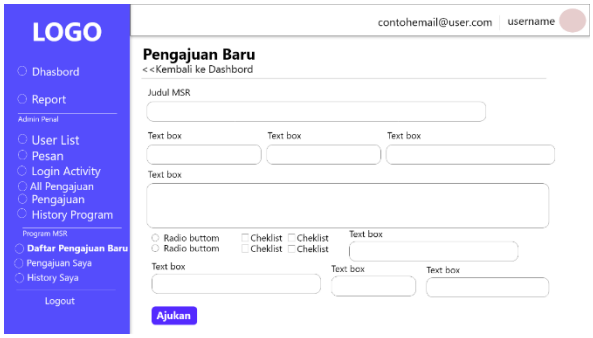

Figure 8. Add New Submission Page

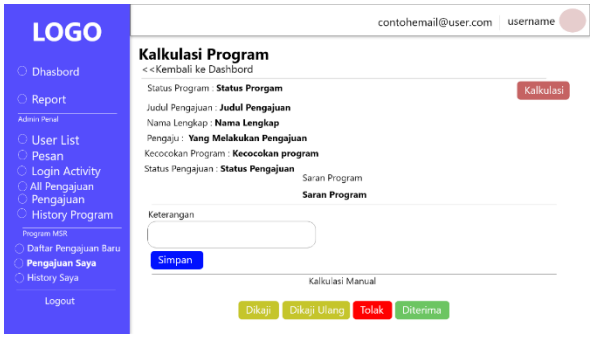

Figure 9. Calculation Page

System Making

System creation is the stage of writing lines of code from the results of previous analysis, to create a system in the form of a website, at this stage the creation of using PHP programming language with CodeIgniter framework.

Testing

1. System testing

System testing is carried out to evaluate the stages of system creation whether the system has been made under the analysis and design of the system. At this stage, researchers conducted testing on the software using the Blackbox Testing method. Software testing in terms of specific functions without passing the design and code testing of the program that can tell whether the process is running correctly, input to the output of software or software under the specifications and functions needed.

Blackbox test is the overall results of the website page if the result is valid, which means that all existing components work under the expected results. In contrast, invalid means some features do not run as expected. The black box test results can be seen in Table 4 as follows.

Table 4. Blackbox Test Results

No.	Page	Testing
1	Login	Valid
2	Dashboard	Valid
3	List of Submissions	Valid
4	Add New Submissions	Valid
5	Calculation	Valid

2. Decision Support System Testing

The results related to decisions obtained from the decision support system are as in Table 5:

Table 5. Decision Support System Testing Results

No	Calculation Results	Test Results
1	Status Ditolak	Valid
2	Bantuan Pendidikan	Valid
3	Bantuan Sahabat Guru Indonesia	Valid
4	Bantuan Modal Usaha	Valid
5	Bantuan Prasejahtera	Valid
6	Bantuan Renovasi Rumah	Valid
7	Bantuan Renovasi MCK	Valid
8	Bantuan Sumur Wakaf	Valid
9	Status Dikaji	Valid

Maintenance

At the maintenance stage, the finished software is operated by the user and will be maintained or maintained, at this stage also allows

the developer to make improvements to errors that occurred in the previous step.

The result of this study is a decision support and monitoring system of an MSR humanitarian program that will produce a conclusion to the data inputted by the user. The results of the test are as follows:

CONCLUSION

By using website-based technology to conduct data collection and monitoring of humanitarian programs, as well as the implementation of a decision support system to get results following the rules that have been determined, this can answer the problems that occur related to the limitations of people who can evaluate the results of a prospective beneficiary submission and replace data collection that uses documents in the form of paper that have a risk of loss and damage. From the test results, it can be known that the website can run following the expected results, and DSS can work by the rules that have been determined.

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