

## A WEB APPLICATION TO DETECT DOWN SYNDROME IN CHILDREN USING FORWARD CHAINING METHOD

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### Abstract

According to WHO data, the incidence of Down syndrome is 1 in 1,000 live births in the world. Down syndrome is a backward condition in children's physical and mental development resulting from abnormal chromosome development. However, this condition is often manifested too late by the patient's parents. By implementing a web-based application using the forward chaining method aims to help parents in early detection of the down syndrome retardation level. By detecting some of the symptoms that parents feel about the development that occurs in their children early in the right way. This system is very helpful for ordinary people to get information regarding the level of retardation of Down syndrome caused by limited knowledge and difficulties to meet experts in the field. Where through the selection of the web as a medium for the implementation of early detection of the level of down syndrome retardation in children can expand the range of use, because it can be accessed via the internet without having to do the installation first. Thus, Down syndrome sufferers get maximum support and attention from the closest and closest people so that children with Down syndrome can grow happy and have a decent life like other normal children even though this Down syndrome cannot be cured.

**Keywords:** *down syndrome, forward chaining, level of retardation, web*

### Abstrak

Menurut data WHO, kejadian down syndrome adalah 1 dari 1.000 kelahiran hidup di dunia. Down syndrome adalah kondisi terbelakang dalam perkembangan fisik dan mental anak-anak yang dihasilkan dari perkembangan kromosom yang abnormal. Namun, kondisi ini seringkali terlambat diwujudkan oleh orang tua penderita. Dengan menerapkan aplikasi berbasis web menggunakan metode forward chaining bertujuan untuk membantu orang tua dalam melakukan deteksi dini tingkat retardasi down syndrom. Dengan mendeteksi beberapa gejala yang dirasakan orang tua terhadap perkembangan yang terjadi pada anak mereka sejak dini dengan cara yang benar. Sistem ini sangat membantu masyarakat awam untuk mendapatkan informasi berkenaan dengan tingkat retardasi down syndrome yang diakibatkan keterbatasan pengetahuan dan kesulitan untuk menemui ahli dalam bidang tersebut. Dimana melalui pemilihan web sebagai media untuk implementasi deteksi dini tingkat keterbelakangan down syndrome pada anak-anak dapat memperluas rentang penggunaan, karena dapat diakses melalui internet tanpa harus melkaukan penginstalan terlebih dahulu. Dengan demikian, penderita down syndrome mendapatkan dukungan dan perhatian maksimal dari orang-orang terdekat dan terdekat sehingga anak-anak dengan down syndrome dapat tumbuh bahagia dan memiliki kehidupan yang layak seperti anak normal lainnya meskipun down syndrome ini tidak dapat disembuhkan.

**Kata Kunci:** *down syndrome, forward chaining, level of retardation, web*

### 1. Introduction

Down syndrome condition of mental retardation and physical development of children resulting from the development of chromosomal abnormalities. In the journal also reported that there were at least 300 thousand cases of Down syndrome in Indonesia [1]. Down syndrome is a backward condition in the physical and mental development of a child that results from abnormal

chromosomal development [2]. For a patient down syndrome they need is support and maximum attention of people nearby and surrounding that children down syndrome sufferers can grow happily and have a decent life like other normal children despite this syndrome down incurable. According to WHO data says that the incidence of Down syndrome is 1 in 1,000 live births in the world. With estimated there were 3,000 to 5,000 babies born with chromosomal abnormalities

annually. Children who suffer from Down syndrome have different circumstances with other normal children, where the children with Down syndrome have a condition of mental retardation and physical development [3]. It is caused by abnormalities in chromosomes during pregnancy lasting development. Therefore, it is important to instill the right mindset to the community, especially for parents who have children with down syndrome that their children deserve a normal life and can perform the same activities as other normal children [4].

In this digital era, the progress of information technology is growing very rapidly. The web is a computer network consisting of a collection of internet sites that offer text, graphics, sound, and animated resources through hypertext transfer protocol [5]. In a previous study that applied the forward chaining method in designing healthy menu determination applications for pregnant women. There are 6 interrelated tables that will produce inference machines that have accurate data based on 60 rules of play through the Cooper method in pregnant women in determining the menu of healthy nutrition based on ideal body weight so that the nutrition of pregnant women is balanced [6]. In addition, by using a web-based application the community can access wherever they are. So, data collection in the development of children with Down syndrome can be more effective and is digitalized. Therefore, the application of early detection of mental down syndrome retardation levels in children is made web-based, so that it can be accessed anywhere without being limited by distance and time, and not costly. Mental retardation is a condition with intelligence that is less (subnormal) since the development period (from birth or since childhood) [7]. Based on the background, the formulation of the problem is: "how to create a web application to detect down syndrome in children using the forward chaining method?".

## 2. Methods

The methodology used in making this web-based application uses the waterfall method where in developing software there are five stages, namely communication, planning, modeling, construction and deployment [8]. In making web down syndrome the method used is the forward chaining method because it is quite effective to use. Inference methods that do reasoning from a problem to the solution, because the inference begins with information that is available and the conclusions are obtained only [9]. Forward chaining is a method for generating conclusions by

initiating available data-driven inferences. This method has the following characteristics:

- A method that starts from a group of data that will be carried out inference based on the rule that has been applied to reach the optimal conclusion.
- The looping process will continue to be carried out on the inference engine until it reaches an accurate decision result.
- The advantage of this method is that it is possible to make an inference rules change in the inference database table.

For example, given 10 rules stored in the knowledge base, namely:

- R1: if A and B then C,
- R2: if C then D,
- R3: if A and E then F,
- R4: if A then G,
- R5: if F and G then D,
- R6: if G and E then H,
- R7: if C and H then I,
- R8: if I and A then J,
- R9: if G then J,
- R10: if J then K.

The initial facts given are only A and E, wanting to prove whether K is true. The Forward Chaining reasoning process is shown in Figure 1.

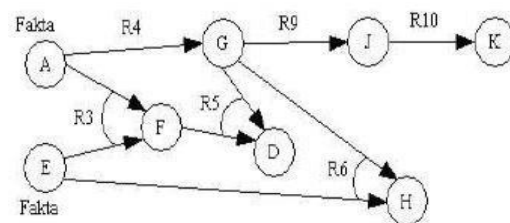


Figure 1. Forward Chaining Reasoning Process

## 3. Results and Analysis

### Needs Analysis

This stage is carried out by analyzing existing processes as seen from the construction needs of the software [10]. Based on the analysis with regard to children with down syndrome can be obtained some important things, namely down syndrome is one of the problems with regard to the development in children is quite alarming in Indonesia, factors that cause mental retardation in children occurs due to the low level of concern during pregnancy and still lack the knowledge to deal with children with Down Syndrome.

Based on the analysis of the problems regarding people with Down syndrome, it will be designed a web-based application that can represent each of knowledge to determine the level of mental

retardation in Down syndrome children. Thus, with this application is expected to provide suggestions or references to users on how to deal with children with Down syndrome. In this retardation detection application, made in the form of a rule-based system, where knowledge is stored in the form of rules if-then. And from interviews that have been made to the expert which is a psychologist who has a lot of work with children with Down syndrome, it can be seen how the information underlying the determination of the level of retardation, Down Syndrome child. The information can then be represented in the form of rules. There are 10 rules stored in the knowledge base. The table below is an application of rules used in the early detection of children with mental retardation down syndrome [3].

TABLE 1  
DATA RULES

Rule	Command
Rule 1	IF there is a cognitive disorder THEN check disruption cognitive ELSE THEN check Psychosocial disorders.
Rule 2	IF experiencing delays in talking at the age of 1-2 years OR having difficulty memorizing OR having difficulty writing OR having difficulty in knowing the time OR experiencing difficulties in the introduction of money THEN mild retardation.
Rule 3	IF very slow in knowing languages OR difficulty in making decisions OR difficulty in remembering what is taught OR experiencing delayed speech at the age of 2-3 years THEN moderate retardation.
Rule 4	IF only able to write simple lines and shapes imperfectly like normal children OR do not have the ability to compose sentences OR do not have the ability to compose sentences THEN severe retardation.
Rule 5	IF having difficulty communicating well OR experiencing difficulties in understanding social causes OR difficulty in managing emotions and expression THEN mild retardation.
Rule 6	IF able to show maladaptive behavior OR need help in doing daily activities THEN moderate retardation.
Rule 7	IF must be monitored for 24 hours THEN profound retardation level.
Rule 8	IF there is a physical disruption THEN check interference physical.
Rule 9	IF can't run properly THEN severe level.
Rule 10	IF suffering from a serious congenital disease OR use body movements to express their feelings THEN profound retardation level.

According to the table above in the

manufacture of this web application inference mechanism is a very important component, as it works in managing to get a conclusion as troubleshooting. In the inference mechanism originating from the web in order to detect early levels of child retardation against Down Syndrome patients begins with the user giving input according to what symptoms they experience. After that, the system will carry out the detection process and check the answers that will be adjusted to the rules that have been stored in the existing database. If the data is appropriate, a conclusion can be drawn on the level of retardation suffered by a child suffering from Down Syndrome and the results will be displayed to the user.

Activities carried out by a user who has been registered with the system will be illustrated with the use case diagram as shown in Figure 3 below. Parents of Down Syndrome children are actors in the use case diagram, while those who are experts are psychologists who will help carry out care and observation of the development of Down Syndrome children.

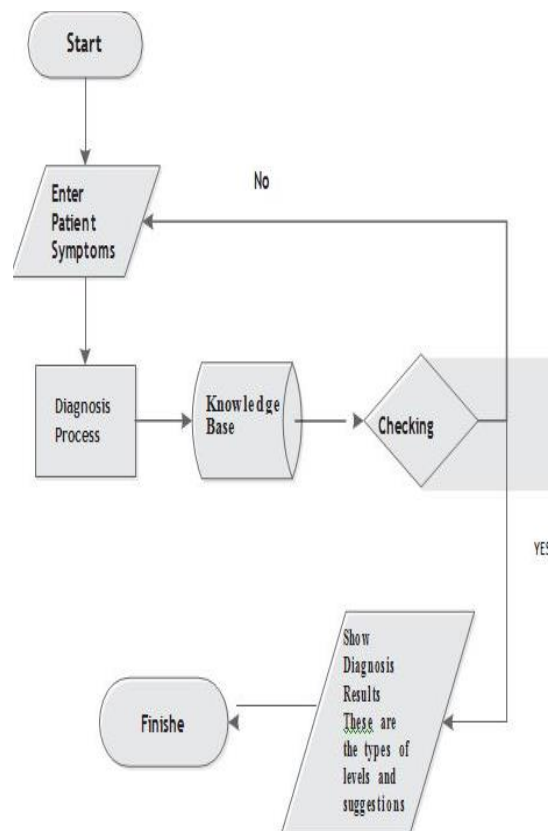


Figure 2. Flowchart of Forward Chaining Inference Mechanism

Based on the Figure 2, it explains that there are two actors, namely users and experts, as explained previously. Each of these actors has duties according to their respective functions.

**Discussion**

As the results described earlier, the application to detect early retardation of web-based children with Down Syndrome can help parents to see the condition of their child's development. In addition, by using a web-based application the community can access wherever they are. So, data collection in the development of children with Down syndrome can be more effective, and is digitalized. Where in this web-based application has several menus including:

a. Home Menu

Home menu is the main display in the application to detect early retardation of children with web-based down syndrome.



Figure 3. Home view

Figure 3 shows that there are several menus including the menu about us, down syndrome detection, speech therapy and more.

b. Display of Down Syndrome Detection Page

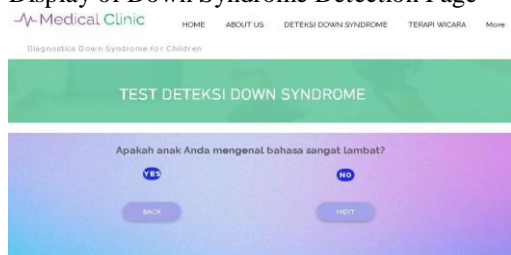


Figure 4. Page views detection of down syndrome

Figure 4 shows the appearance of the Down syndrome detection page. Where on this display parents hurry to fill in the conditions seen in the child on all lists of questions that will appear on the web page.

c. Down Syndrome Detection Results Page

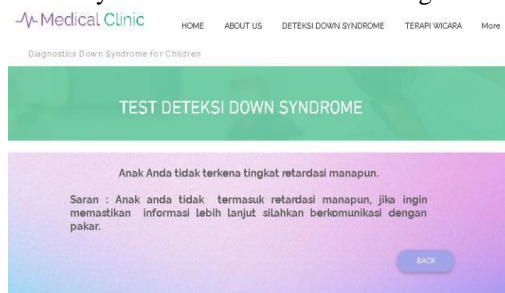


Figure 5. Down syndrome detection results page

To see the level of user satisfaction with the application. The author evaluates through distributing questionnaires aimed at a number of respondents who are users of the early detection application for retardation web-based children with Down syndrome. the user consists of a number of students, lay people and parents of children who suffer from down syndrome. In addition, testing is done by conducting a demo to experts and testing the web security through white box testing.

Using this system will make it easier for people, especially parents, to be more sensitive to children's development. Parents can see facts and information related to what symptoms their child is experiencing. So, they can deduce what is happening to their baby. Thus parents know what they have to do, if their children experience symptoms of Down syndrome according to the level of retardation experienced quickly and precisely. The following will explain the level of retardation of Down syndrome in children. Where each level is symbolized by the code "R1" for the first retardation level, "R2" for the second retardation level, "R4" for the third retardation level, and "R4" for the fourth retardation level [11]. This can be seen in the following Table 2.

TABLE 2  
 LEVEL OF DOWN SYNDROME RETARDATION

Code of Retardation Level	Level of Down Syndrome Retardation
R1	Mild Retardation Level (IQ 50-69)
R2	Moderate Retardation level (IQ 35-49)
R3	Severe Retardation level (IQ 20-34)
R4	Profound Retardation level (IQ <20)

Based on the level of retardation down syndrome in the table below provides information in the form of symptom that can be useful in the diagnosis of retardation levels of Down syndrome in children. Where each symptom is symbolized by the code "G1" for the first symptom, "G2" for the second symptom, "G3" for the third symptom, and

so on until the last symptom is "G22".

TABLE 3 SYMPTOMS

Symptoms Code	Symptoms
G1	There is a cognitive disorder
G2	Experiencing delays in talking at the age of 1-2 years
G3	Difficulty memorizing
G4	Having difficulty writing
G5	Having difficulty in knowing the time
G6	Experiencing difficulties in the introduction of money
G7	Very slow in knowing languages
G8	Difficulty in making decisions
G9	Difficulty in remembering what is taught
G10	Experiencing delayed speech at the age of 2-3 years
G11	Only able to write simple lines and shapes imperfectly like normal children
G12	Do not have the ability to compose sentences
G13	Having difficulty communicating well
G14	Experiencing difficulties in understanding social causes
G15	Difficulty in managing emotions and expression
G16	Able to show maladaptive behavior
G17	Need help in doing daily activities
G18	Must be monitored for 24 hours
G19	There is a physical disruption
G20	Can't run properly
G21	Suffering from a serious congenital disease
G22	Use body movements to express their feelings

After knowing the list of symptoms experienced above, then in this section each retardation level down syndrome will be grouped based on the accompanying symptoms. This can be seen in the following Table 4.

TABLE 3 SYMPTOMS

Code of Retardation Level	Level of Down Syndrome Retardation	Symptoms Code	Symptoms
R1	Mild Retardation Level	G1	There is a cognitive disorder
		G2	Experiencing delays in talking at the age of 1-2 years
		G3	Difficulty memorizing
		G4	Having difficulty writing
		G5	Having difficulty in knowing the time
		G6	Experiencing difficulties in the introduction of

		G13	Having difficulty communicating well
		G14	Experiencing difficulties in understanding social causes
		G15	Difficulty in managing emotions and expression
R2	Moderate Retardation Level	G1	There is a cognitive disorder
		G7	Very slow in knowing languages
		G8	Difficulty in making decisions
		G9	Difficulty in remembering what is taught
		G10	Experiencing delayed speech at the age of 2-3 years
		G16	Able to show maladaptive behavior
R3	Severe Retardation Level	G1	There is a cognitive disorder
		G11	Only able to write simple lines and shapes imperfectly like normal children
		G12	Do not have the ability to compose sentences
		G19	There is a physical disruption
		G20	Can't run properly
		G21	Suffering from a serious congenital disease
R4	Profound Retardation Level	G1	There is a cognitive disorder
		G18	Must be monitored for 24 hours
		G19	There is a physical disruption
		G21	Suffering from a serious congenital disease
		G22	Use body movements to express their feelings

### Questionnaire

Web testing is done by distributing questionnaires to 50 people from several circles as described earlier. By distributing questionnaires, researchers can find out the level of respondents' satisfaction with the application by conducting a usability test. There are 4 factors that are used as parameters, namely can be learned, efficiency, easy to remember and error. Below will explain the results of the questionnaire that has been done, and it can be seen that the majority of users are satisfied

with the application made. The results of the answers given in the questionnaire are as follows:

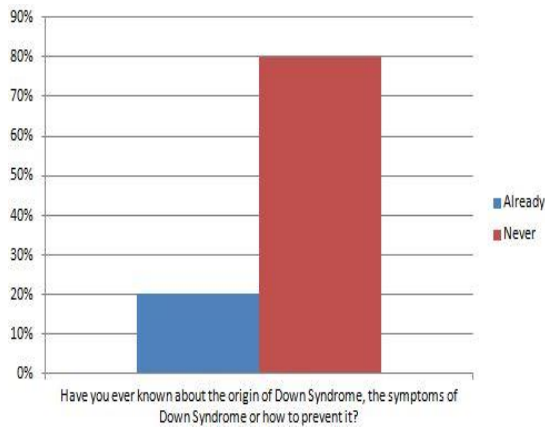


Figure 6. Answer Questionnaire Diagram Number 1

Figure 6 shows 20% of the 50 respondents consisting of 10 respondents, answered that they had already known about Down syndrome, the symptoms shown by Down syndrome children and their prevention. While as many as 80% said they had never known Down Syndrome. From the first question with 80% of users who answered that they had never known Down syndrome, it meant showing very little knowledge of the community regarding Down syndrome both in terms of definitions, causes, symptoms and how to do prevention.

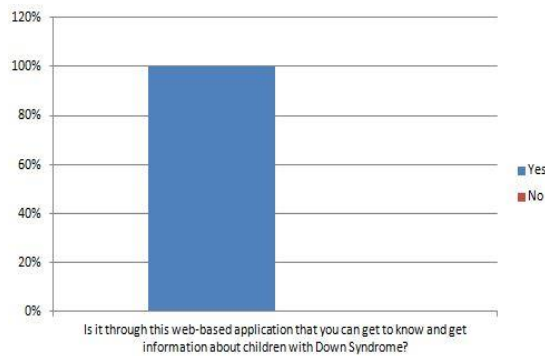


Figure 1. Questionnaire Answer Chart Number 2

In the Figure 7, 100% of the 50 respondents answered that they could know and obtain information regarding Down Syndrome patients by using an early detection application to retardation the web-based children with Down syndrome. From the second question obtained 100% of responsible users this application helps in obtaining information regarding Down Syndrome sufferers, meaning that this application is friendly, easy to use by users and very useful for the community in searching for information regarding

down syndrome.

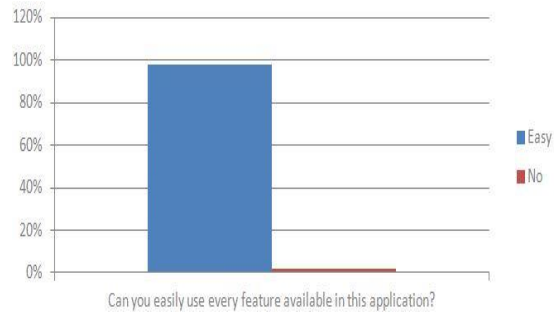


Figure 8. Answer Chart of Questionnaire Number 3

Figure 8 shows 98% of the 50 respondents consisting of 2 respondents, answering respondents can easily use every feature available in the early detection application for retardation this web-based down syndrome child. Whereas Syndrome or how to prevent it. While as many as 2% said it was not easy to use every feature available in the early detection application for retardation this web-based down syndrome child. In the third question, 98% of the 50 respondents answered that they could easily use every feature available in the Down Syndrome application, meaning that this application was very suitable to be used in finding information about Down syndrome because people did not experience difficulties in using it.

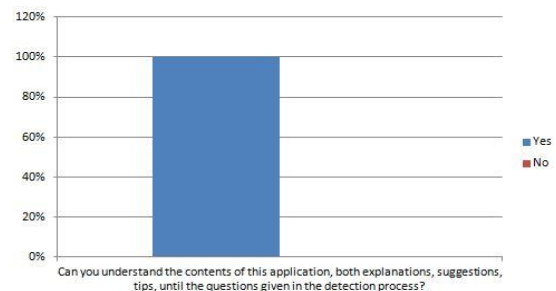


Figure 9. Questionnaire Answer Number 4

Figure 9 shows 100% of the 50 respondents answered can understand the contents contained in this application, both explanations, suggestions, tips, to questions addressed to users in the process of making detection. The fourth question shows 100% of the 50 respondents showed a positive response to the application of this web-based application. That means showing that people can easily understand the contents contained in this application, both in terms of member explanations, suggestions, tips, to questions directed at users in the process of early detection of mental retardation of children with Down syndrome.



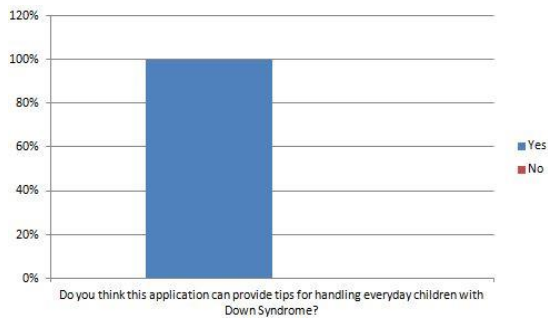


Figure 10. Answer Questionnaire Diagram Number 5

Figure 10 shows that as many as 50 respondents or about 100% of respondents consider that this application can provide tips for handling the daily lives of children with Down Syndrome. Whereas no respondent or around 0% of respondents consider that this application cannot provide tips for handling the daily lives of children with Down Syndrome. The fifth question shows that 100% of the 50 respondents showed a positive response, indicating that with this application the community was greatly helped in getting information regarding a number of tips that could be used as a way to solve daily problems in children with Down Syndrome.

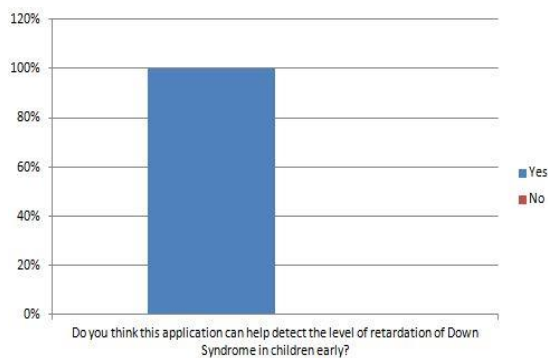


Figure 11. Answer Chart of Questionnaire Number 6

Figure 11 shows 100% of 50 respondents consider that the application of early detection of retardation of web-based children with Down syndrome can help in detecting Down Syndrome retardation in children early. In the sixth question shows 100% of the 50 respondents think positively that this application can help the community to detect early retardation of children with Down Syndrome early on.

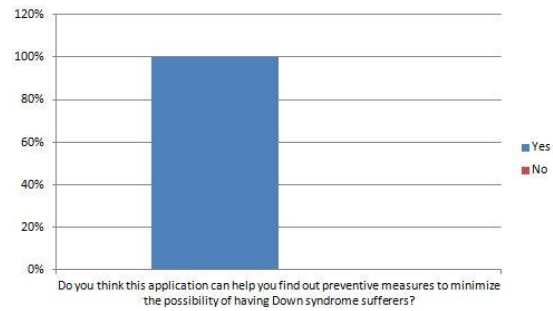


Figure 12. Answer Questionnaire Diagram Number 7

Figure 12 shows 100% of 50 respondents assume that using this application can help in anticipating by taking preventive measures to minimize the possibility that occurs in children with Down syndrome. On the seventh question that shows 100% of the 50 respondents responded that this application can help in anticipating the conduct of preventive measures in order to minimize the likelihood that occurs in Down syndrome. Thus, the community, especially prospective mothers who are in a pregnant condition can be more vigilant in maintaining their contents to avoid mental retardation caused by Down syndrome.

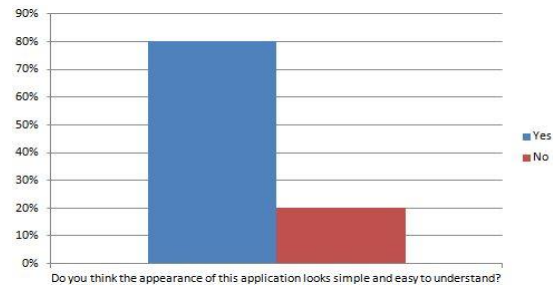


Figure 13. Questionnaire Answer Chart Number 8

Figure 13 shows 80% of the 50 respondents consisting of 10 respondents answered that the appearance of this application looks simple and easy to understand. Meanwhile, as many as 20% answered that the appearance does not look simple and is not easy to understand. On the eighth question shows 80% of 50 respondents consisting of 10 respondents, means that this application in the eyes of the public is very easy to understand and understand in its use because it is user friendly.

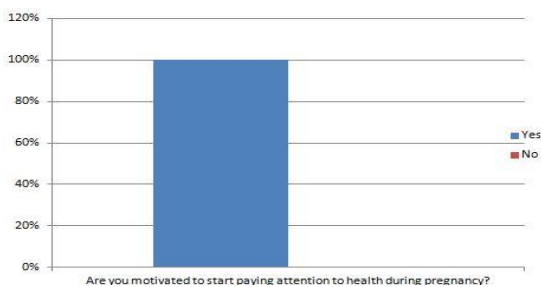


Figure 14. Answer Questionnaire Diagram Number 9

In Figure 14, 100% of the 50 respondents were encouraged to always pay attention to their health during the pregnancy process by doing some prevention. In the ninth question, 100% of the 50 respondents showed a positive response, meaning that with this application, people were encouraged, especially the prospective mothers, to always pay attention to their health during the pregnancy process with early prevention.

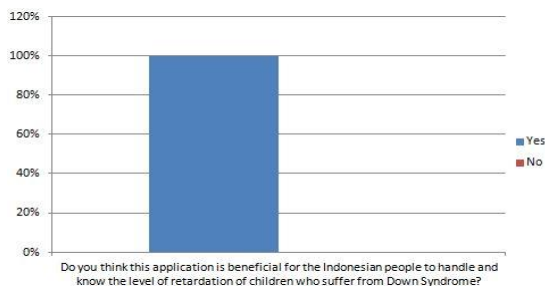


Figure 15. Questionnaire Answer Chart Number 10

Figure 15 shows 100% of 50 respondents think that this application is very beneficial for the people of Indonesia to conduct early detection of children who suffer from Down Syndrome. Whereas there were no respondents or around 0% of respondents who thought that this application was not beneficial for the Indonesian people in preventing children suffering from Down Syndrome. On the tenth question shows 100% of the 50 respondents think positively towards the application of this application, meaning that this application is very beneficial for the community, especially the parents in taking precautionary measures as early as possible against syndrome down retardation.

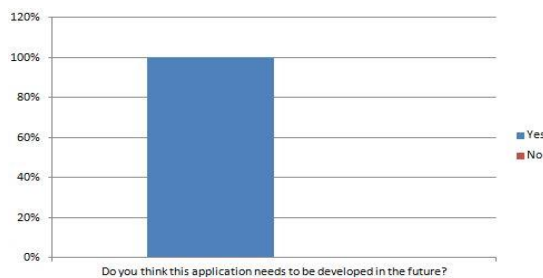


Figure 16. Answer Questionnaire Diagram Number 11

Figure 16 shows 100% of the 50 respondents think that this application needs to be developed in the future. The last question shows that 100% of the 50 respondents hope that there is still a need to develop the application for the future to optimize the work function of the application. So that, the community will be more complete-get information regarding mental retardation of children with Down syndrome.

### Expert Testing

By doing testing through experts regarding the feasibility of the system, researchers will be able to assess the system in accordance with the initial objectives of making the system. So, as researchers can find out whether this web-based application is appropriate, correct in production, and safe for use by the community. Testing is done to experts through a demonstration regarding the workings of the application and the functions and benefits of the application for children with Down syndrome. The results show that the web is in accordance with the objectives and is suitable for use by the community in general who want to know information regarding Down syndrome.

### White Box Test Results

White box testing is the method used by testers in conducting software testing as a whole through testing to recognize the ins and outs of the system, design, and system implementation [12] to produce a 100% correct and detailed program, it can be done with a white box in conducting application work system testing in detecting the level of Down Syndrome retardation in children.



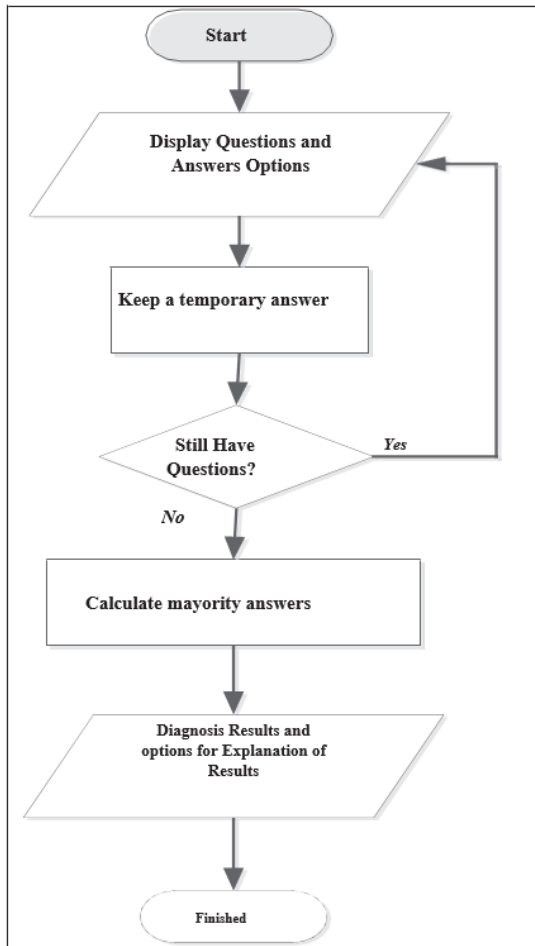


Figure 17. White Box Detection Process

In detecting the level of retardation in children with down syndrome. By answering a number of questions in the application, it is automatically registered as the application user. Then the answers from users will be processed according to the rules in the database. If the user's answer is in accordance with the rules made, then the next process is to display the results of the retardation rate of Down syndrome according to what symptoms the user experiences when entering their symptoms.

The results obtained by users are in the form of levels from retardation, ranging from mild, moderate, severe and very severe. The results obtained will be seen from the user's answer when answering some of the questions displayed on the application page. If the user answers three "yes" questions from five questions, then the level of retardation is low, and answers two questions "yes" then the result is a moderate level of retardation, this is because the answers made are taken from the maximum symptom data from the level of retardation. will result in no problems found in the form of early detection of the level of retardation

of Down Syndrome in children.

#### 4. Conclusion

After completing the web for early detection of Down Syndrome underdevelopment in children, from the evaluation results it can be concluded that 80% of the 50 respondents did not know the information regarding down syndrome both the origin, symptoms and methods of prevention. However, the selection of the web as a medium for the implementation of early detection of the level of down syndrome retardation in children can expand the range of use, because it can be accessed via the internet without doing the installation first. In addition, 100% of respondents think that this application is very helpful in finding information regarding Down syndrome and encourages prospective parents to be more careful in maintaining their content by doing prevention early on to find out the level of retardation of children who have symptoms of Down syndrome. Especially the laity and for parents who have children with Down syndrome, starting from the origin of the occurrence of Down syndrome, prevention and symptoms experienced, with appearance and language that is interesting and easy to understand. So, you can immediately carry out further treatment under the supervision of an expert.

#### References

- [1] Renawati, Rudi Saprudin Darwis, and Hery Wibowo, "Social Interaction Of Down Syndrome Children With Social Environment (Study Of Case Of Down Syndrome Children Who School In Slb Pusppa Suryakanti Bandung)," *Research & PKM Journal*, vol. 4 No.2, no. Social Interaction Of Down Syndrome Children, pp. 129 - 389, July 2017.
- [2] Rusdial Marta, "Cognitive Handling of Down Syndrome through Puzzle Methods in Early Childhood," *Obsession Journal*, vol. 1 no.1, no. Down Syndrome through Puzzle Methods, pp. 32-41, 2017.
- [3] Christine Leonita, and Nina Sevani, "The Web for Early Detection of the Retardation of Down Syndrome in Children," *Journal of Informatics and Information Systems*, vol. 1 no. 1, no. Early Detection of the Retardation of Down Syndrome, pp. 7-15, April 2015.
- [4] Hubert Wojtowicz , Jolanta Wojtowicz, Wojciech Koziol, Wieslaw Wajs, "Medical Decision Support System Architecture for Diagnosis of Down's Syndrome," in *Federated Conference on Computer Science and Information Systems*, 2013, pp. 179-182.

- [5] Rintho Rante Rerung, *Basic Web Programming, 1st ed., Chintia Morris, Ed.* Yogyakarta, Sleman: Deepublish, 2018.
- [6] Erly Krisnanik, Kraugusteeliana, and Vini Indiasari, "Design of Healthy Menu Expert System Model for Nutrition-Based Pregnant Women Using Tehe Cooper Method," *Journal of Information Technology and Computer Science*, vol. 5 No.6, no. *Design of Healthy Menu Expert System*, pp. 643-652, November 2018.
- [7] Abdul Muhith, *Life Nursing Education: Theory and Application, 1st ed., Monica Bendetu, Ed.* Yogyakarta: ANDI, 2015.
- [8] Achmad Solichin, *Web Programming with PHP and MySQL.* Jakarta, Ciledug Raya: Budi Luhur, 2016.
- [9] Fajril Akbara, Alvi Dwi Wahyuni, and Husnil Kamil, "Utilization of Web and Mobile Applications to Support the Arrangement of Building Permit for Baso Sub-District Agam," *Journal of Technology and Information Systems*, vol. 04 no.02, no. *Mobile Applications to Support the Arrangement*, pp. 073-080, August 2018.
- [10] Prawidya Destarianto, Erni Yudaningtias, and Sholeh Hadi Pramono, "Application of Inference Tree and Forward Chaining Methods in Expert Systems for Diagnosing Symptoms of Damage," *Journal of EECCIS*, vol. 7 No.1, no. *Inference Tree and Forward Chaining*, pp. 21-27, June 2013.
- [11] Titi Sunarwati Sularyo and Muzal Kadim, "Retardasi Mental," *Sari Pediatri*, vol. 2 No. 3, no. *Down Syndrome*, pp. 170 - 177, Desember 2000.
- [12] Rizal Arif Zulfikar and Ahmad Afif Supianto, "Design and Development of Mobile Based Polyclinic Budget Applications," *Journal of Information Technology and Computer Science (JTIK)*, vol. 3 No. 5, no. *Design and of Mobile Application*, pp. 361-370, Agustus 2018.