1. INTRODUCTION

1.1 Background of This Study

The lack of supporting health facilities that are sophisticated and accurate about the system that helps health workers in maternal and infant health checks received many researchers' attention. An examination and monitoring of health conditions certainly need to produce decisions or diagnoses with a high level of accuracy and efficiency so that solutions and suggested actions can be appropriate and minimize the possibility of harm to the mother and baby. The problem of diagnosing a pregnancy disease will be very complex if many of the symptoms are similar to the symptoms of other diseases because more and more combinations of components may occur, wherein the selection of a combination, the rules set out in deciding the diagnosis must be considered.

IT's ability to remember and store information can be utilized without having to rely on obstacles such as those of humans. Currently, there are many mobile applications regarding expert systems that can store data and a set of good reasoning rules that allow them to provide conclusions or make decisions of the same quality as an expert's ability. One of them is a mobile application related to health problems, such as a mobile application made as an initial diagnosis of pregnancy disease and the possibility type of childbirth.

Based on this difficulty, it is necessary to develop the right system for helping health workers which have high accuracy and efficiency. Some several methods and algorithms are often used in solving decision-making problems. Examples of these methods are expert systems with forward chaining and the certainty factor method as applied in this study.

The purpose of an expert system is not to replace human's role but to present human knowledge in the form of a system to use it. With this expert system, it is also hoped that ordinary people can solve quite complex problems. The real thing can only be solved with the help of experts. For experts, this expert system will also help their activities as highly experienced assistants.

From the main problem above, the authors are interested in making an expert system design that can help reduce maternal and infant mortality, namely by diagnosing abnormalities in early pregnancy and the possibility of childbirth's procedure implemented into an application program, with the title, "Developing Mobile Expert Systems for Antenatal Care Using Forward Chaining and Certainty Factor Method."

1.2 Research Status Analysis

This research will discuss plans to develop an expert system for antenatal care based on Forward Chaining and Certainty Factor Method for diagnosing diseases in pregnancy till the possibility type of childbirth procedure and providing solutions and actions that need to be taken. The reason for using this method is because it can provide accurate results obtained from calculations based on the weight of the symptoms selected by the user, is able to provide answers to problems that are not certain, such as the problem of disease risk diagnosis, and with this method the expert describes the belief of an expert by giving appropriate confidence weights with related expert knowledge. This system can be used as a tool to diagnose diseases during pregnancy and possible types of childbirth procedure that pay attention to the symptoms of pregnant women using Forward Chaining, so as to produce accurate information about the causes and suggestions for treatment [9]. Certainty factor method was chosen because it is suitable for expert systems to measure whether something is specific or uncertain in diagnosing disease. As one example, calculations using this method in one count can only process 2 data so that the accuracy of the data can be

maintained. This expert system is a way to make it more efficient and more accessible for someone to know or diagnose early on from pregnancy disease quickly.

Expertise is knowledge obtained from training, reading, and experience. This expertise allows experts to make decisions faster and better than someone who is not an expert. "Expert System is a system designed to be able to mimic the expertise of an expert in answering questions and solving problems (T.Sutojo et al. 2011: 13).

The theory of the Certainty Factor (CF) was proposed by Shortliffe and Buchanan in 1975 to accommodate an expert's inexact reasoning [1]. An expert (e.g., a doctor) is often uncertain in analyzing existing information by revealing "possible," "most likely," "almost certain." a certainty factor is used to describe the level of expert confidence in the problem at hand.

1.3 Significant of The Study

1.3.1 Formulation of Problems

Based on the background above, researcher identified the problems that occur in the field as follows:

1. How does this application will help obstetrician/midwife/health worker, to diagnosing diseases in pregnancy till the possibility type of childbirth procedure and providing solutions and actions that need to be taken?
2. In diagnosing pregnancy problems, there are many obstacles in terms of accuracy and optimization. For example, a pregnancy disorder has the same or similar symptoms as other pregnancy disorder and possibly other unexplained symptoms.
3. Using the PHP programming language and the MYSQL database management system, designing and building a mobile-based system to diagnose diseases and the possibility type of childbirth based on forward chaining and certainty factor methods.
4. The feasibility of forward chaining and certainty factor method approach to the problem of diagnosing pregnancy diseases and pregnancy possibility type of childbirth procedure of pregnant women.
5. How can people use the application easily without feeling confused?

1.3.2 Limitation of Problems

The scope of the research to be discussed are as follows:

1. Creating an expert system to detect pregnancy disorders to the possibility type of childbirth with forward chaining and certainty factor method to reduce maternal and infant mortality rates in Indonesia which is caused by not detected early/accurate pregnancy diseases and incorrect determination of the type of childbirth procedure.
2. Creating an expert system to detect pregnancy disorders to the possibility type of childbirth with Disease Information Management. Diseases that are discussed are only those related to pregnancy and childbirth procedure.
3. Creating an expert system to detect pregnancy disorders to the possibility type of childbirth with User Information Management.
4. Creating an expert system to detect pregnancy disorders to the possibility type of childbirth with Admin Information Management.
5. Creating an expert system to detect pregnancy disorders to the possibility type of childbirth with Rule Information Management.
6. This application is only compatible with the Android Operating System.
7. This application just provides English Language.

1.3.3 Benefits of Research

Research on the use of forward chaining and certainty factor methods for expert systems to diagnose pregnancy disorders till the possibility type of childbirth procedure is expected to be useful both in theory and practice:

2 Theoretically

a. For the development of science, especially for the world of software engineering.
b. Discover how to implement forward chaining and certainty factor method to diagnose pregnant women's disorders and it's types of childbirth procedure.

2 Practically

For Researcher:

a. Understanding the work process of forward chaining and certainty factor method also the forms of their implementation
b. As a portfolio for researcher who are helpful for the future.

For University:

a. As reference material for future research.
b. As an evaluation material for universities in developing science, it relates to forward chaining and certainty factor method-based programs.

For Medical Fields:

Decrease the number of misdiagnoses in pregnant women disease and their solutions also the possibility type of childbirth procedure.

For Government:

Reducing mothers' and babies' mortality rate in Indonesia that caused by undetected early pregnancy disorders, misdiagnosis, inaccurate diagnostic solutions, and failure of the childbirth process.

1.4 Literature Review

Many previous studies have been conducted regarding implementing the Forward Chaining and Certainty Factor method for disease diagnosis in software development on mobile and web platforms. To develop this mobile-based software by utilizing certainty factor methods for diagnosing diseases in pregnancy till the possibility type of childbirth procedure and providing solutions and actions that need to be taken, it is necessary to conduct a literature study as one of the steps for implementing the research method that will be carried out. Among them are avoiding re-creation, identifying methods that have been used, identifying gaps, continuing previous research, and knowing other people whose specialties and research areas are the same in this field. Some of the earlier studies related to the review literature are as follows:

1. Research conducted by Siti Mujilahwati from Lecturer at the Faculty of Engineering, Informatics Engineering Study Program, the Islamic University of Lamongan in 2014 with ISSN 2085–0859 entitled "Diagnosis of Ornamental Plant Diseases Using Web-Based Certainty Factor Methods"[2]. This study discusses ornamental plant businesses that have a lot of difficulty in diagnosing pests in plants due to various types of plant diseases, causing errors in providing solutions to plants that pests have attacked. With these problems, ornamental plant cultivators need an expert system that is reliable

in providing information for disease diagnosis and solutions. The application system built here uses the PHP programming language using the MySQL DBMS. It is expected that the resulting software can calculate the types of diseases and their solutions.

2. Research conducted by Jadiaman Parhusip, Viktor H. Pranatawijaya, Dwimaryuga Putrisetiani from the Department of Informatics, Palangkaraya University, 2012 with ISSN 1979-2328 entitled "Expert System for Diagnosing Heart Disease Using Web-Based Certainty Factor Methods"[3]. This research discusses Heart Disease. One of the techniques in computer-based heart disease diagnosis that uses knowledge, facts, and reasoning techniques to solve a problem usually can only be solved by an expert in a specific field. It can provide added value with expert system technology to assist in dealing with an increasingly modern era. Here, the development method uses the waterfall method, which consists of needs analysis and definition, software system design, implementation, testing, and maintenance. In the study of needs and purposes, this stage is to collect all the requirements in general. This need is the initial basis of the continuing process. Then in the input and output interface design is the software system design. Therefore, the goal is to develop an expert system used for the initial diagnosis of heart disease based on the felt symptoms. Furthermore, the system will display these symptoms' confidence level for possible diseases suffered by the patient. The trust value is the result of calculations using the certainty factor (CF) method. The system implementation is translated into the PHP programming language and can run/accessed via the web-based, which the general public can access.
3. Research conducted by Mochammad Irfan, Jusak, Tania Saskianti from the Study Program / Department of Information Systems STMIK STIKOM Surabaya in 2015 with ISSN 2338-137X entitled "Design of Web-Based Expert System Identification of Dental Diseases Using Certainty Factor Methods."[4] This study discusses the teeth, which are the complex parts in the mouth. The teeth have a varied structure that functions like a cutter, rip, and chewer of food. If the teeth are not cleaned after eating, it can cause bacteria to appear. These bacteria can damage teeth and cause a person to develop dental disease, and cavities can be accompanied by toothache, which can interfere with one's activities in doing work. The lack of knowledge of the people about the disease they are suffering from and the high cost of having their teeth checked by the dentist has resulted in people not coming to the dental hospital. But people come when they have severe problems with their teeth. Based on the existing problems, an application is needed to diagnose and provide driving factors and treatment factors for a person's disease. This is to increase public awareness in caring for their teeth. This application uses an expert system with a certainty factor method. Expert systems can model in solving problems like an expert, and this certainty factor method was chosen because it produces outputs in the form of several alternative disease diagnoses (output is not only one type of disease), so the CF method is very suitable for solving the problem of a disease diagnosis expert system. This application is carried out by giving questions to the user, which will later be processed by an expert system that uses the Certainty Factor method inference. This expert system will be made web-based because so that all people can access this application easily. This is supported by people who have cellphones that can access a web browser with an internet connection. This application can be a tool for the lack of public knowledge of the disease they suffer so that people are aware of the importance of dental examinations at the dentist.

1.5 Schedule

Scheduling will be implemented in this thesis as follows:

Table 0.1 Thesis Project Schedule

No	Activities	Weeks								
		1	2	3	4	5	6	7	8	9
1	Literature review									
2	Analysis of needs/requirements									
3	Design									
4	Coding									
5	Testing									
6	documentation									

The process of arranging this thesis takes approximately 9 weeks

1.6 Organizational Structure of The Paper

As for the systematic structure, this thesis is divided into five chapters, with explanations for each chapter as follows:

CHAPTER 1 INTRODUCTION

In his chapter, the author discusses the background of research, identification of problems, research objectives, limitations, benefits of research, and schedule. This chapter also contains literature reviews that support and related to this thesis research.

CHAPTER 2 RELATED TECHNOLOGIES AND THEORIES

In this chapter, the author discusses the fundamental theories that support and related to this thesis research. This chapter contains theoretical basis, which used as a basis for understanding the process of developing a project that supports this Final Project thesis.

CHAPTER 3 RESEARCH ANALYSIS AND DESIGN

In this chapter, the author discusses the analysis of the general description or the current condition, then analysis the current system continues to research the analysis of system needs. The research result of user's needs analysis and design of the system.

CHAPTER 4 IMPLEMENTATION AND TESTING

In this chapter, there will be an explanation of the results of the implementation made by the author. A detailed description of the application explained by the functions of the features. Moreover, it also illustrates the system's user interfaces and conducts testing of the system to determine whether the application is already done or still needs improvement.

CHAPTER 5 SUMMARY

This chapter contains the conclusions of this thesis and advises those who used as references for future development.