CHAPTER 1 INTRODUCTION

1.1. Background

The objective of the project is to support the achievement of Sustainable Development Goal 3 (SDG 3): Health and Wellbeing. SDG 3 is an integral part of the UN 2030 Sustainable Development Agenda. The main goal of SDG 3 is to promote healthy lives and well-being for all people, regardless of age. The project will focus on several key aspects to achieve SDG 3, including: Improving access to fair and equitable health services, reducing preventable maternal and child deaths, and addressing the burden of communicable and non-communicable diseases.

In addition, the project will highlight the importance of universal health coverage, comprehensive health education, and women's empowerment in efforts to achieve SDG 3 (Halkos and Gkampoura 2021). The project focuses on health and well-being as a key element of sustainable development, has a positive and long-term impact on society, and provides better opportunities for all people to lead healthy and dignified lives.

Indonesia is the area with the second largest number of diabetes mellitus sufferers in the Asian region Southeast with an incidence rate of 9,116.03 cases. Increased blood sugar levels can be prevented by doing self-care consisting of: diet management, exercise, medical therapy, foot care, and blood sugar monitoring (Chaidir, Wahyuni, and Furkhani 2017). Diabetes mellitus (DM) or diabetes is a metabolic disorder characterized by hyperglycemia (high glucose levels in the blood) due to insulin deficiency, insulin resistance or both. Insulin is a hormone produced by pancreatic β cells to control blood glucose by regulating glucose use and storage. The main cause of insulin deficiency is damage to the pancreatic β cells, namely the cells that function to produce insulin. DM is a dangerous disease, because over a long period of time it can cause damage to tissues, organs, dysfunction of the eyes, kidneys, nervous system and blood vessels. Diabetics are at increased risk occurrence of other diseases such as heart disease, cardiovascular system disorders, obesity, cataracts, erectile dysfunction, liver disease, cancer, and infectious diseases (Hardianto 2021). Diabetes is a chronic medical condition that affects how your body processes glucose, a type of sugar that serves as a primary source of energy. There are several types of diabetes, but the two most common ones are Type-1 diabetes and Type-2 diabetes. Here's an overview of each type:

i. Type-1 Diabetes: This is an autoimmune condition in which the immune system attacks and destroys the insulin-producing beta cells in the pancreas. As a result, the body can't

produce insulin, leading to a lack of glucose control. People with Type-1 diabetes require lifelong insulin therapy to manage their blood sugar levels (Adelita, Arto, and Deliana 2020).

ii. Type-2 Diabetes: This is the most common form of diabetes, often linked to lifestyle factors like poor diet, lack of physical activity, and obesity. In Type-2 diabetes, the body doesn't effectively use insulin, a condition known as insulin resistance, and eventually can't produce enough insulin to maintain normal blood sugar levels. Treatment often involves lifestyle changes, oral medications, and, in some cases, insulin therapy (Alpian and Alfarizi 2022).

Diabetes can attack anyone, both men and women, and all age groups. However, some risk factors can increase a person's chances of having diabetes. These factors include:

a. Heredity: A family history of diabetes can increase a person's risk of developing this disease.
b. Lifestyle: An unhealthy lifestyle, including poor diet, lack of physical activity, and obesity, is a major risk factor for type 2 diabetes.
c. Age: The risk of type 2 diabetes increases with age. Although type 1 diabetes can occur at any age, it usually appears in childhood or adolescence.
d. Gestational Diabetes: Women who have experienced gestational diabetes during pregnancy also have a higher risk of developing type 2 diabetes later in life.
e. Other Medical Factors: Certain medical conditions such as metabolic syndrome, hypertension, and polycystic ovaries (PCOS) can increase the risk of diabetes.
f. Stress and Lack of Sleep: Chronic stress and lack of sleep can affect the body's sensitivity to insulin and increase the risk of diabetes.
g. History of Diabetes: If you have had gestational diabetes or had high blood sugar levels previously, you are at higher risk of developing diabetes.

While everyone is at risk of having diabetes, you can reduce your risk by adopting a healthy lifestyle, including eating a balanced diet, maintaining a healthy weight, exercising regularly, and managing stress (Permana et al. 2023).

This research aims to find out how to apply the Expert System in diagnosing disease diabetes and knowing how to apply the Dempster-Shafer method in generating internal information diagnose the symptoms of a disease experienced by the community.

For detection systems, the Dempster-Shafer method can be used because it is able to handle uncertainty by allowing objects or events that have an uncertain level of confidence. In addition, the Dempster-Shafer method allows combining information from multiple sources and produces an integrated belief distribution. By assigning a level of trust

to each source, Dempster-Shafer can process information more efficiently in a systematic way. The Dempster-Shafer method is also flexible in terms of decision making. The Dempster-Shafer method provides flexibility in describing uncertainty and makes it possible to produce more rational decisions based on the level of confidence given to each element of information. The system receives clinical data from the patient, such as glucose and insulin levels, and uses fuzzy techniques to process the data into diagnostic results. Dempster-shafer techniques to process the data into diagnostic results that assist doctors in diagnosing that assist doctors in diagnosing diabetes.

1.2. Problem Statement

This problem statement provides guidance for finding concrete solutions for the development and design of the Diabetes Detection System Project, and each problem is an important part of the project's success. The following are several problem formulations that the author collected while researching several journals relevant to the project :

i. Limitations of Current Method: Current diabetes detection method may not be effective or easy to use by the general public. Self-detection tools have not achieved the desired level of accuracy, but laboratory tests involving blood sampling are time-consuming and costly.
ii. Inadequacy of Early Detection: Early detection of diabetes is crucial to prevent serious complications. However, prevention efforts can be hampered if there is no system in place that can provide early warning to people at high risk or who have been diagnosed with diabetes.
iii. Unavailability of Integrated Systems: Integrated systems that combine the latest technologies such as artificial intelligence, user-friendly user interfaces to offer a comprehensive diabetes detection solution are currently rare.

1.3. Objectives

This objectives will help in providing effective solutions in detecting diabetes early and managing the disease better. The following are some of the objectives of the project based on the problem statement:

i. To develop of an Diabetes Detection System: Using the latest technologies such as expert systems, develop a system that can accurately detect diabetes.
ii. To notify diabetes detection results: The result of diabetes detection, will be sent to the user's email by the system.
iii. To report detection results: After detecting diabetes using the diabetes detection system, the user can print a report of the detection through the pdf feature.

1.4. Project Scope

1.4.1. User Scope

a. User are required to register first
b. User can login to existing account
c. User can manage their profile
d. User can input personal information such as (name, age, weight, height, family history of diabetes, etc.)
e. User can input the diabetes symptoms are they have such as increased thirst (polydipsia), frequent urination (polyuria), weight loss, increased hunger (polyphagia), fatigue (fatigue), etc, for diabetes detection.
f. User can view detection result after they detect diabetes
g. User can view detection history
h. User can log out from the system

1.4.2. System Scope

This scope system will cover the main functions required to create an effective and functioning diabetes detection system.

a. Blood Glucose Data Collection : Users will be able to enter blood glucose data, including glucose levels and measurement times, into the system.
b. Data Processing: The system will calculate the average and significant changes in the user's blood glucose.
c. Diabetes and Prediabetes Detection : Based on the entered blood glucose data, the system will use a detection algorithm to identify possible diabetes or prediabetes.
d. Treatment Recommendations: If a person is found to have diabetes or prediabetes, the system will provide them with suggestions about changes in diet, physical exercise, and medication management.
e. User Profile Management : Users can create and manage their profiles, which include information such as name, date of birth, weight and height.
f. Medical History Management : Users can enter and monitor their medical history, such as allergies, diabetes, and other medical conditions.
g. Data History and Reporting : User blood glucose data can be saved in history and reports can be used by users and health professionals.

1.4.3. Admin Scope

Admin scope is important in maintaining smooth system operations and ensuring security and service continuity.

a. Admin can login into the system
b. Admin can manage user account
c. Admin can manage user data
d. Admin can input disease data
e. Admin can manage symptoms data
f. Admin can manage detection history
g. Admin can manage of care plans
h. Admin can log out from system

1.5. Assumption And Limitation

1.5.1. Assumptions

a. Accurate Data Provided: The system bases analysis on data provided by the user. The main assumption is that the data entered by the user is accurate and truthful. Errors or inaccuracies in user data may affect analysis results.
b. Accuracy of Analysis: The system assumes that the analysis methods used in detecting diabetes and providing recommendations are accurate and reliable. Using inappropriate methods or inappropriate algorithms can produce inaccurate results.
c. Medication adherence: For people diagnosed with diabetes, the assumption is that they will comply with the prescribed medications and instructions given by healthcare professionals.
d. Diabetes classification accuracy: The system assumes that the diabetes classification based on user input is accurate. The type of diabetes detected through this application may need to be confirmed through further health examination.

1.5.2. Limitations

The limitations of developing this diabetes detection application are :

a. Does not replace medical advice: This system does not replace medical advice. Although it provides recommendations and test results, this system cannot provide an official medical diagnosis. Consultation with a healthcare professional is always necessary to confirm and continue treatment.
b. Cannot replace health checks: This app cannot perform health checks. Some symptoms and signs of diabetes may require a physical examination by a health professional.

c. Data Limit: This system is limited to user provided data. It may not cover all relevant risk factors or symptoms, which may affect the accuracy of the analysis. And this diabetes detection system can only detect type-1, type-2 diabetes by displaying the results of selecting the symptoms experienced by the user.

1.6. Significance

a. This system can detect diabetes or prediabetes in people early, allowing for better prevention and management.
b. Personalized recommendations can be provided to patients by this system, thereby helping them to better control their blood glucose, medications and lifestyle.
c. The system can help reduce long-term health care costs associated with diabetes complications and hospitalizations by encouraging early detection and effective management.
d. The data collected by the system can help with ongoing diabetes research and development, which could lead to new treatments.