CHAPTER I

INTRODUCTION

1.1 Research Background

Mental health is one of the most important aspects of human life, especially in the modern era characterized by rapid changes, technological disruption, and increasing social and economic pressures (Magomedova & Fatima, 2025). Mental health is a condition of psychological well-being that allows individuals to manage life's challenges, recognize their potential, acquire knowledge effectively, perform their tasks efficiently, and actively participate in their community (World Health Organization, 2022b). However, despite the crucial role mental health plays in the lives of individuals and societies, mental disorders remain a significant global health issue.

In Indonesia, the Indonesia National Adolescent Mental Health Survey (I-NAMHS) found that 34.9% of adolescents aged 10–17 experienced mental health issues, and 5.5% met the criteria for a mental disorder within 12 months. Based on the 2020 Indonesian population census, out of a total of 44 million adolescents, there were 13 million adolescents with mental health problems and 2 million with mental disorders (Badan Pusat Statistik, 2021; Center for Reproductive Health et al., 2022). The visualization of the proportion of mental health among Indonesian adolescents, based on the 2020 Census by the Central Statistics Agency (Badan Pusat Statistik), is presented in Figure 1.1.

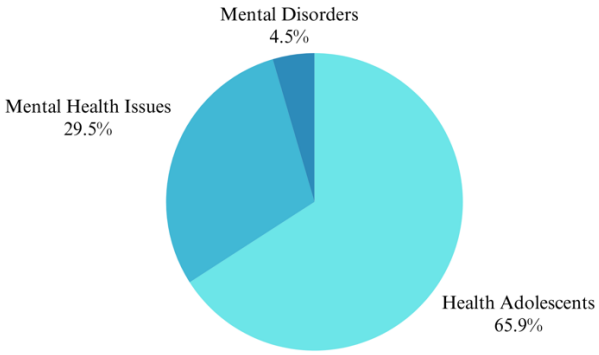

Figure 1.1 Indonesian Adolescents' Mental Health Proportion (2020 Census)
(Source: Author's Documentation)

There are various types of mental health problems, with mood disorders such as depression and bipolar being among the most common, especially in today's generation. Mood disorders involve prolonged sadness, intense happiness, or drastic mood swings that affect quality of life (Samhsa, 2013). Moods are less intense than emotions, usually lasting longer and not always triggered by specific situations (Anjania Rifani & Rianto Rahadi, 2021). Individuals with mood disorders such as depression have difficulty feeling and expressing their emotions (Junaidi & Sumarni, 2024).

In Indonesia, mental health services have been integrated into the National Health Insurance (JKN) system under Law No. 24 of 2014. However, a survey by I-NAMHS found that less than 3% of adolescents with mental health issues sought professional help for emotional and behavioral, with many turning to school staff (38.2%) instead of healthcare professionals such as doctors, psychiatrists, or psychologists (Center for Reproductive Health et al., 2022). This may indicate that access to health services in Indonesia is not yet fully accessible to all people. Additionally, social stigma, discrimination, and a lack of awareness about mental health prevent many individuals from seeking professional health care.

Consequently, many individuals rely on self-help strategies such as meditation and prayer to manage emotional and behavioral challenges (Center for Reproductive Health et al., 2022; World Health Organization, 2022a).

Simple daily habits, like understanding what brings you happiness and recognizing triggers, can help maintain mood and well-being (Anjania Rifani & Rianto Rahadi, 2021). One effective way is through journaling or diary writing. A study by (Suhr et al., 2017) found that participants who wrote a diary for four weeks about positive experiences, had significantly lower depression scores than those who did not. This suggests that writing about positive experiences can helps regulate emotions in daily life. But, traditional journaling with paper and pen can be challenging for some people, as it can be exhausting and time-consuming, with limited visual elements that restrict self-expression. However, digital journaling on platforms like blogs can help address these challenges (Lin et al., 2014).

To help mitigate this issue, the researcher aims to develop an Android-based mobile application capable of tracking and classifying users' moods to help individuals better understand themselves by recognizing the influence of mood changes based on their daily activities. The system integrates a trained Artificial Neural Network (ANN) model from previous research conducted while the researcher participated in the Bangkit Academy 2024 Batch 2 program to classify users' average daily mood. The team of researchers chose ANN because it has proven effective in classification tasks and is easy to implement with modern tools. Mobile platforms are chosen because they are widely used for communication, entertainment, and information access (Shah, 2023), and have proven effective in supporting health management through mHealth apps (Alslaity et al., 2022).

The system will feature an intuitive, interactive, simple, and visually appealing interface, with measurable mood tracking, data visualizations, and mood analysis using an integrated ANN model. To enhance user engagement, the system will incorporate elements such as educational onboarding quizzes, journaling progress bars, daily challenges, and a color-coded mood calendar. Previous studies highlight the importance of simple, intuitive and easy-to-navigate design (Schueller et al., 2021; Widnall et al., 2020) recommend the inclusion of interactive features such as quizzes, guides, or polls (Zahira Fitriani & Anggara, 2024). These align with gamification principles that apply game elements in non-game contexts to enhance motivation and experience (Six et al., 2021).

However, if not carefully designed, gamification can have adverse effects, especially for individuals with depression-related reward insensitivity (e.g., anhedonia), further reducing their motivation (Six et al., 2021). This highlights that gamification's effectiveness depends on how well its design aligns with users' psychological contexts and needs. Therefore, this research will focus on designing gamification features that foster engagement while preserving and supporting users' psychological well-being.

The app is expected to be user-friendly by providing guidance for ease of use, offering flexibility in mood tracking, and supporting users in maintaining consistency. This assumption is supported by prior studies. (Caldeira et al., 2018; Zahira Fitriani & Anggara, 2024) noted that many mood tracking apps or mHealth lack clear instructional support, underscoring the need for in-app guidance. (Widnall et al., 2020) emphasized the value of flexible tracking features to suit individual user needs, such as the ability to add descriptions or make multiple

entries each day. Moreover, (Alslaity et al., 2022) identified reminders as one of a commonly used strategy in mHealth apps to encourage consistent engagement.

To ensure the system aligns with user needs and expectations, its development follows the design thinking approach a human-centered method that emphasizes empathy, problem definition, ideation, prototyping, and testing (Cahyadi et al., 2023; Pratiwi & Suchahyani, 2024). The features of this application will be based on a combination of literature reviews and interviews with selected students and workers, ensuring that the resulting mood tracking and classification system is closely aligned with users' needs, desires, and challenges.

The ANN model will be implemented directly on the device to address challenges associated with cloud-based models, such as cost, latency, and especially privacy, as the application handles personal and sensitive data (Dai et al., 2019). Besides enhancing data security, on-device AI remains relatively uncommon, making this project a valuable research contribution. Overall, the system is designed to serve as an alternative tool for mood tracking and journaling, especially for students and workers who are more vulnerable to mental health issues, with the aim of supporting their overall well-being through a private, engaging, and supportive environment.

Therefore, based on the explanation above, the researcher intends to conduct research titled **"Mobile App Development for Tracking and Classifying Mood with On-Device Artificial Neural Network Model"**.

1.2 Research Problem Identification

Based on the background that has been described, the research problems can be identified as follows:

a) Mental health services that are not yet accessible to all people.
b) The presence of social stigma and discrimination against individuals with mental health issues or disorders, often driven by a lack of education and awareness, discourages them from speaking out or seeking treatment from professional help.
c) Manually recording and tracking moods to identify patterns can be challenging for some people due to its time-consuming nature and limited visual elements that restrict self-expression.
d) There are still few mental health applications that use gamification approaches with designs truly aligned to the psychological needs of users.
e) A user-centered design approach is needed to ensure the application fully meets the expectations and needs of the target users.
f) Applications integrated with Artificial Intelligent (AI) hosted on the cloud sometimes face challenges related to cost, latency and privacy, especially when processing sensitive personal health data.

1.3 Problem Limitation

To address the previously identified issues, it is essential to define the scope of the research by focusing on specific aspects that need to be addressed. The following are the problem limitation that must be considered:

a) The development of mood tracking and classification focuses on the implementation of an Artificial Neural Network (ANN) model embedded within the system.
b) The Artificial Neural Network (ANN) model used is a trained model, without additional training within the system.

c) The system processes only user input from the self-report method, without using other data sources.

d) The mood tracking and classification system includes five scale categories: Terrible, Bad, Okay, Good, and Excellent.

e) The activities that can be chosen, which affect mood changes, fall into nine categories: Dating, Eating, Entertainment, Self-Care, Sleep, Study, Traveling, Work, and Workout.

f) The system is designed only for Android applications and does not support other operating systems.

g) User data is stored locally in the database, without cloud or external server integration, ensuring user privacy.

h) This research will not take into account the efficiency or weight of the model integrated into the device.

i) The mood tracking and classification system will be present and process the data in English.

j) To ensure the alignment of the system's design and certain content with psychological aspects, consultations were conducted with professional experts in human psychology.

k) The mood tracking and classification system will be evaluated using Unit Testing and Black Box Testing to analyze the application's performance, while the System Usability Scale (SUS) will be used to assess its usability.

1.4 Research Problem Formulation

Based on the research background, the research problem formulation to be studied in this research is as follows:

a) How can Design Thinking approach be used to design the user journey and gamification elements of a mood tracking system that meets users' needs?
b) How can a mood tracking and classification system integrate with an on-device Artificial Neural Network (ANN) be designed and developed?
c) How usable is the mood tracking and classification system in facilitating users to record their daily emotional experiences?

1.5 Research Objectives

Based on the research problem formulation, the objectives of this research are as follows:

a) To design the user journey and gamification elements of a mood tracking system using the Design Thinking approach in alignment with user needs.
b) To design and develop an on-device mood tracking and classification system integrated with an Artificial Neural Network (ANN) to support the improvement of mental well-being.
c) To evaluate the usability of the mood tracking and classification system in facilitating users to record their daily emotional experiences.

1.6 Benefits of Research Results

This research is expected to provide benefits, namely theoretical and practical. The theoretical benefits focus on contributing to the advancement of knowledge, while the practical benefits emphasize the real-world application of the research findings.

a) Theoretical Benefits

This research advances the theoretical understanding of affective computing and AI by exploring the use of Artificial Neural Networks (ANN) in mood tracking applications. It contributes to studies on emotional data processing, personalized intelligent systems, and on-device AI in mental health, particularly in balancing efficiency and user privacy. By adopting the design thinking methodology, this research also provides theoretical insights into user-centered system design for emotional well-being applications.

b) Practical Benefits

1. For the General Public

   Provides an accessible and privacy-focused mood tracking tool, helping to raise self-awareness about mental health and reduce stigma in society.

2. For Mental Health Professional

   Serves as an additional resource for assessing patients' emotional conditions based on data collected from the user's application.

3. For Application Developers and Future Research

   Serves as a reference for application developers in designing on-device AI for mental health, emphasizing privacy through local data processing. Also offers practical insights into applying design thinking for user-centered development. For future research, provides a foundation to advance AI-based mood tracking through improved accuracy, personalization, and user experience.