CHAPTER 1
INTRODUCTION

1.1 Background

Brushing teeth is a daily routine every people do regardless of any age and gender, as it is their responsibilities to keep their dental hygiene clean. Brushing teeth itself is an action where people use toothbrush and toothpaste to clean their teeth, easier said than done, yet many people do not realize the importance of a simple act of brushing teeth especially children (age from 4 to 12) [1]. Even though the whole world is facing dental problems, 3rd world countries like Indonesia faces heavier issues due to the lack of dentist (only 33.100 dentist out of 267 million of population), lack of social awareness and lack of resources for regular check-up and dental maintenance [1].

According to The Global Burden of Disease Study 2016, dental and oral problems (especially dental caries) affect nearly half of the world’s population (3.58 billion people), with periodontal (gum disease) being the 11th most common disease in the world [4]. While the most common dental and gum problems in Indonesia consist of damaged/hollow/sick teeth (45.3%) and swollen gums/abscesses (14%) [4]. In 2018, 4 out of 5 of Indonesian’s population suffers from teeth problem and are 1 of the 10 largest disease in primary care [1]. Meanwhile in 2019, a research done by Kemenkes (Kementrian Kesehatan), the prevalence of cavities in early childhood is still very high, namely 93%, meaning that only 7% of children do not have a problem with dental caries [1].

Although it may seem like a minor issue, dental issues in children are very serious as children with dental issues cannot chew food effectively which impacts the full absorption of nutrients. Some children even refuse to eat due to the discomfort from the toothache, these reasons may cause the lack of nutrients essential for the children, without sufficient nutrients, this may result in stunt growth in children. Dental issues in Indonesia are mostly caused by the lack of brushing teeth, as in 2018, research done by Riskesdas (Riset Kesehatan Dasar) stated that only 2.8% of the population brush their teeth twice in a day.
The research also stated that the lack of brushing teeth is a bad habit picked up from the population childhood days, this might be because of lack of awareness or high consumption of sugar-based diet, as Indonesian tend to feed their children milk and sweet tea before they go straight to sleep [2].

Direct problem caused by gum problems affect the children through pain from the toothache, as 41% of the children with toothache states that the intensity of the pain is moderate to severe [3]. While indirect problems caused by the pain affects them academically and socially. Approximately, 37% of children admitted that they had to be absent from school with an average number of absences of two days per child in a year [3]. The pain also caused 29% of the children to experience sleep disturbances so that they had to go to school in a drowsy state [3]. Meanwhile socially, dental problems in children were twice as likely to experience self-confidence crises, social difficulties and even refused to show their smile compared to children with healthy teeth and mouths.

Virtual Reality or commonly known as VR is a technology that is used in many fields ranging from medical field, military training, games and even educational studies [31]. It is a computer-generated simulator that simulates an artificial three-dimensional environment with which a person may interact by wearing special glasses with displays or wearing gloves with sensors [30]. The machine becomes the designer of this artificial environment by imitating as many senses as possible, such as sight, hearing, touch, and smell thus making it very versatile for training by simulating a real-life experience [32].

Having known these facts in hand, the author proposes a serious game focusing on the genre of education and health known as Brushed Away. Brushed Away is a VR (Virtual Reality) game about brushing teeth. As brushing teeth is a habit formed from early childhood days, making game would be an efficient way in reaching the user (aged 4-12). The game helps raising the awareness of the importance of brushing teeth in hope that it could help reduce the percentage of dental health issues in Indonesia. The game is intentionally made VR in-order to gain the curiosity and the interactivity from the user. VR is used as the main attraction of the game as the technology is
getting bigger while at the same time getting cheaper. Thus, by playing the
game, it would help the children not only in terms of raising awareness but also
in terms of reflex stimulation and another form of entertainment.

1.2 Scope

This thesis will be focusing mainly on the database and the API add-ons of
the virtual reality game development. Therefore, the author will be responsible
for the following features:

- Create a database to store player’s information.
- Create a web application to increase the efficiency in the
management of the database.
- The web application will be showing the overall information of the
player in form of charts so that the admin to be able to view the
players’ data reference.
- Deploy database and connecting the game data directly to the
database through API.
- Creating the alternative storage of the data when the game is offline.
- Making the login and register system page inside the game.

However, the author collaborated with Jerdy, Ryan and Binus University
International in the making of Brushed Away, in hope that the game will help
in increasing Indonesian population’s awareness. This thesis project is a virtual
reality games where the user will be using the virtual reality device to be in a
simulation in which the user will have to brush a monster’s teeth until it is
perfectly clean. Then the user will proceed to the next level along with the rise
of the difficulty per increase in level.

Generally, this project includes 2 main features:

- Virtual reality
  This technology is used so that the user can experience the game
closer to the real world. This component is also used to enhance the
entertainment and more realistic educational game.
- Levels
This project includes levelling up to increase the difficulty along with the excitement level to its users. This feature is available once the user proceeds to the next round of the game.

1.3 Aims and Benefits

1.3.1 Aims

The aim of this thesis project is to design and develop a virtual reality game prototype, in which, the purpose is to create a virtual reality environment for the user to interact and also to create a simulation of brushing teeth for the users to be able to experience real-life scenarios. Furthermore, the aim is not only to raise the awareness of the users the importance of dental hygiene but also to for them to be able to have fun.

For this thesis specifically, the aims of the author are to develop the database for the storage of the game and user’s data and a web application to edit, delete and add the content of the database will also be added to manage the database efficiently. The web application will also be able to view the players’ complete dataset in the form of several charts for future reference in possible further development. The game’s data will also be stored in a text file to act as a precaution when the gaming device is not connected to the internet. The author also makes APIs needed for the game-creating platform to be connected directly to the database. As for the game itself, the author designed and made the feature of the login and register of the game player, along with its data storage in database and offline.

1.3.2 Benefits

This thesis’ benefits hoped to be achieved are as follows:

- The web application acts as an add-on for the virtual reality game in which the admins can manage the players’ data. It is connected to the database.
- The players’ data are shown in various data charts in order for further research.
- Through the APIs made, data from the game can be stored in the database.
- Offline storage to prevent data loss in case the game device suddenly went offline.
• Game features such as register and login so that players could see their own achievement and progress in the web application.
• With all the benefits above mentioned, the author also hopes that Brushed Away will help Bina Nusantara University International in terms of reaching more people and the percentage of dental problems of children in Indonesia will decrease.

1.4 Thesis Structure

This thesis comprises seven main chapters, each of which discusses a different aspect of the thesis.

• Chapter 1: Introduction
  This chapter describes the thesis’ background, scope, aim and benefits, as well as its structure.
• Chapter 2: Theoretical Foundation
  The second chapter of this thesis provides fundamental theories, technologies, and methodologies used as the base of this thesis.
• Chapter 3: Problem Analysis
  This chapter covers a detailed analysis of the problem that need to be solved for this project and existing technologies to resolve it, ended with the author’s proposed solution.
• Chapter 4: Solution Design
  This segment explains the author’s proposed solution system design that includes relevant diagrams for better understanding.
• Chapter 5: Testing and Implementation
  This chapter describes the testing phase of the proposed solution and the result of its implementation.
• Chapter 6: Discussion
  This section evaluates the project implementation based on its result on the previous chapter.
• Chapter 7: Conclusion and Recommendation
  This chapter concludes the thesis and provides recommendation for future development for the project.