



Faculty of Computer Science and Information Technology

***SekNC: AN ANDROID MOBILE APPLICATION CHATBOT FOR
DEMENTIA CAREGIVER***

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Bachelor of Computer Science with Honours

(Software Engineering)

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***SekNC: AN ANDROID MOBILE APPLICATION CHATBOT FOR
DEMENTIA CAREGIVER***

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This project is submitted in partial fulfillment of the
requirements for the degree of
Bachelor of Computer Science with Honours (Software Engineering)

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UNIVERSITI MALAYSIA SARAWAK

2023

***SekNC: APLIKASI BOT SEMBANG MUDAH ALIH ANDROID UNTUK
PENJAGA PESAKIT DEMENTIA***

CHEN HUI TONG

Projek ini merupakan satu keperluan untuk
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ABSTRACT

SekNC: An Android Mobile Application Chatbot For Dementia Caregiver is a chatbot developed to relief tension and helplessness of caregivers while taking care of a patient with dementia or Alzheimer disease. Caregivers might lack knowledge in medical and taking care process, thus this chatbot is proposed to overcome these problems. Chatbot to relieve burden of caregiver is a journey to work for and experts had concluded that existing related applications has not been enough for caregivers and patient. The reason for developing this chatbot application is to help overcome problems faced by caregivers when taking care of patients. The chatbot proposed is free to use. Apart from the chatting features, extra resources regarding dementia and writing diary features will also be included. Agile development methodology is applied to implement in this application development. Phases included in this methodology are requirement gathering, planning, design, implementation, testing, deployment, and review phase. The application is tested using User Acceptance Testing to evaluate its functionality. Lastly, the system is being released and feedback continuously collected from users to further enhance.

ABSTRAK

SekNC: Chatbot Aplikasi Mudah Alih Android Untuk Penjaga Pesakit Dementia ialah bot sembang yang dibangunkan untuk melegakan ketegangan dan ketidakberdayaan penjaga dengan menjaga pesakit yang mengalami dementia atau penyakit Alzheimer. Penjaga mungkin kekurangan pengetahuan dalam proses perubatan dan penjagaan, justeru chatbot ini dicadangkan untuk mengatasi masalah ini. Chatbot untuk meringankan beban penjaga adalah satu perjalanan untuk bekerja dan pakar telah membuat kesimpulan bahawa aplikasi berkaitan yang sedia ada tidak mencukupi untuk penjaga dan pesakit. Sebab pembangunan aplikasi chatbot ini adalah untuk membantu mengatasi masalah yang dihadapi oleh penjaga ketika menjaga pesakit. Chatbot yang dicadangkan adalah percuma untuk digunakan. Selain daripada ciri sembang, sumber tambahan mengenai dementia, ciri tulis diari juga akan disertakan. Metodologi pembangunan Agile digunakan untuk dilaksanakan dalam pembangunan aplikasi ini. Fasa yang termasuk dalam metodologi ini ialah fasa pengumpulan keperluan, perancangan, reka bentuk, pelaksanaan, ujian, penggunaan dan semakan. Aplikasi ini diuji menggunakan Ujian Penerimaan Pengguna untuk menilai fungsinya. Akhir sekali, sistem akan dikeluarkan dan maklum balas secara berterusan akan dikumpul daripada pengguna untuk dipertingkatkan persembahan lagi.

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Chapter 1: INTRODUCTION

1.1 Introduction

According to the World Health Organization (WHO), a figure of larger than 55 million people suffer from dementia worldwide and nearly 10 million cases rise every year (“Dementia”, 2022). Dementia is a syndrome of deterioration in cognitive function. It will affect the patient’s cognition, memory, mood, movement, loss of self-care ability, hallucination and so forth. Dementia is an umbrella term for Parkinson’s Disease Dementia, Alzheimer’s disease, and Delirium. This progressive disease is caused by various types of brain changes such as brain metastasis, the cancer cell from other parts of the body spread to the brain. Genetic mutation and inheritance are considered as one of the causes of dementia. (“What Is Dementia? Symptoms, Types, and Diagnosis”, n.d.).

Based on the statistics by World Health Organization (WHO), informal carers refer to caregivers of family members and friends who spend an average of 5 hours to take care of patients a day. (“Dementia”, 2022). As caregivers are not suffering from dementia, they suffer from stress as responsibilities in taking care of a people can be excessive. Great pressure from the perspective of emotional, financial, tiredness and helplessness can overwhelm the life of a caregiver. Caregivers will find helpless when they do not have adequate medical knowledge or skills in this caring process. This will lead to emotional downturn and quality of life is downgrading. A formal caregiver is well-trained to take care of patient who needs daily activities assistance.

Dr Tuan Anh Nguyen, a University of South Australia Senior Research Fellow specialising in dementia, conclude that an online support program is a benefit for informal carers with the aid from virtual assistant which can provide real time and peer support to assure standard care for patient suffering from dementia. (“Could Chatbot Be a Lifeline for Dementia Carers?”, 2020). A software application, chatbot can be used to assist caregiver in daily life. Chatbot is a computer program stimulates human conversation using Artificial Intelligence (AI) and Natural Language

Processing (NLP) to respond to human queries and provide solutions. The conversation can be in type of text to text or text to speech. Google Assistant, Apple Siri, Amazon Alexa are chatbot implemented in daily life. Through chatbot, caregiver can get advice or someone to talk to. It reduces the time of filtering information from the Internet. In this development, I will focus on providing a platform for caregiver to obtain guidance. This chatbot will provide relevant information not limited to further understanding dementia and provide emotional support. Furthermore, simple memory training is available for user to track the stage of dementia.

1.2 Problem Statement

As the world is getting sophisticated, electronic devices are a necessary gadget for us to communicate ranging from toddler to late adulthood. Software applications are designed to carry out specific tasks and chatbot is one of the application types. Chatbot has become an essential tool for business communication, customer engagement, learning or companion bot. According to a Handphone Users Survey 2021 carried out by Malaysian Communications and Multimedia Commission, the overall smartphone penetration rate in Malaysia is 94.8%. (Hilmy, 2022). Penetration rate of smartphone usage between urban and rural area is 92.3% and 96.2% respectively, texting, social networking and video calls are smartphone uses among Malaysians. (Hilmy, 2022). Uses of smartphone in daily life has becoming a norm among people in Malaysia.

For carers who have no transport, low-income family with no support, unable to leave patients, the effect can be overwhelming. They will feel anxiety or guilty which can lead to mental illness or unwanted tragedy. Thus, delivery of information and support via application or online can help them to overcome these boundaries. Some interactive digital applications tested by a group computer scientist and medical researchers found out that none of the applications tested has performed well on the criteria as it contains linguistic biases and usability challenges. (“Chatbots for Dementia Patients and Caregivers Need More Work,” 2021).

In agreement with a computer scientist said that an artificial intelligence chatbot is vital to act as a connection between patient and healthcare system as they keep on increasing ages and new challenges are coming every day (Hristidis, V, 2021). Development of chatbot into dementia care is an opportunity for researchers as it is still in an infancy state, more evidence-based chatbot need to undergo user evaluation to provide adequate support as well as educate caregivers. (Ruggiano et al., 2021). Moreover, no chatbot is solely focusing on this population which provides information on geriatric field of study. Therefore, the development of a free chatbot for dementia patients and caregivers is utterly important.

1.3 Scope

This project is the creation of a chatbot for dementia patient caregivers. There will be an app for Android based smartphones with network connection. It is meant to provide virtual assistance for caregivers to help improve the quality of life such as providing useful resources and answers to queries. This chatbot can register users, interact with users, and suggest resources. Target user for this chatbot is dementia patients' caregiver.

1.4 Aim and Objectives

- 1) To develop a chatbot for caregiver to seek for assistance.
- 2) To request information from system, create, edit, delete a user or admin account.
- 3) To generate monthly or weekly report on the type of the problem and assistance given by the caregiver.

1.5 Brief Methodology

Several methodologies can be used to develop an application in a software project. Examples of methodologies included Agile Development Methodology, Waterfall Development Methodology, Rapid Application Development and Scrum Development Methodology. The methodology applied in this project is Agile Development Methodology.

Agile Development Methodology is based on incremental and iterative development. Agile is known for its flexibility as we can iterate each phase until reaching the goal for that phase. (Kumar and Bhatia, 2012). Ability to adapt to changes effectively is one of the advantages of agile methodology. Process involved in Agile Development Methodology is requirements, design, development, testing, deployment, and review.



Figure 1.1: Agile Development Cycle (What Is Agile Development?, 2020)

Requirement analysis is the first step in Software Development Life Cycle (SDLC) in agile methodology. Functional and non-functional requirements are gathered and defined. This document consists of how this system is doing and what is expected from the system. Apart from the requirements of this application, more information on dementia should be gathered as well.

Design phase is when related diagram such as use case, data flow, class diagram, user interface design is included into documentation. Framework, programming language, libraries, and functions are declared at this phase. Java, Firebase, Dialogflow will be implemented in this application.

Development phases need to transform content from prepared documents into coding and present in a decent way as software application. Requirements are implemented as functions of the application with visualization.

The testing phase is to be carried out to ensure the software runs smoothly. Functionalities are to be tested in this phase. Bugs detected need to reflect to developer for further action. This process will continue until the software is considerably bug free and stable.

Deployment phase is once the software is tested, it is to run on server as a software released to user for real world usage. Review phase is when we collect feedback from user, developer will remove bugs, making enhancements. Result from User Acceptance Test (UAT) is analyzed, and the next iteration of this cycle starts.

1.6 Significance of Project

The significance of this project is to help caregivers and dementia patients to improve life quality by having a chatbot to provide virtual assistance. This application is developed to be used for free for all who need it. Additionally, learning from existing software to develop this application is a vital criterion in continued study.

1.7 Limitations of the Project

The following are some of the constraints that have been placed on the "SekNC: An Android Mobile Application Chatbot for Dementia Caregiver" project:

- 1) Technical Limitations: Due to technical constraints, the project can only result in the construction of an Android mobile application, and it is possible that customers running alternative operating systems will not be able to access it. The effectiveness of the chatbot is also contingent on the availability of a connection to the internet.
- 2) Scope Limitations: The development of a chatbot specifically for people who care for people with dementia is the primary emphasis of this project; as a result, it is possible that it will not be applicable to other groups of carers or to individuals who have other forms of cognitive impairments.
- 3) Accuracy Limitations: Because it uses artificial intelligence and natural language processing to answer user questions and comments, the accuracy of the chatbot's responses

is limited. It is possible that it will not always deliver accurate results, and that it will have certain limitations in terms of its capacity to comprehend the context of the user's inquiries.

- 4) **Data Privacy and Security:** The project needs the gathering and storage of sensitive information, such as the personal details of dementia patients and their carers. This information includes names, addresses, phone numbers, and email addresses. It is imperative that appropriate steps be taken to protect the confidentiality of this information and prevent its disclosure.
- 5) **Adoption by Users:** The success of the initiative is contingent on the willingness of carers to accept the chatbot and include it in their normal routines. There is a possibility of opposition to the utilization of technology in the provision of care, and the chatbot might not be appropriate for all users.
- 6) **Constrained Resources:** The project may have limited resources in terms of budget, labor, and technical competence, which may hinder its capacity to completely execute its goals.
- 7) **Maintenance and Upkeep:** To guarantee the chatbot's continuing efficacy and dependability, it is imperative that it receives routine maintenance and software updates. This may present difficulties in terms of the resources and costs involved.

In conclusion, although the project has the potential to provide considerable benefits to those who care for someone with dementia, it is essential to be aware of its limitations and problems in order to ensure the proper implementation and utilization of the project.

1.8 Expected Outcome

It is anticipated that the completion of the project titled "SekNC: An Android Mobile Application Chatbot for Dementia Caregiver" will result in the delivery of a solution that is dependable and easily accessible for those who are responsible for the care of those who have dementia. It is anticipated that the adoption of the chatbot will result in the following outcomes: