

UNIVERSITI TEKNOLOGI MARA

**AN EMOTION CLASSIFICATION
MODEL OF CHATBOT DESIGN FOR
THE ELDERLY**

SAIFUL AZMAN BIN BIDIN

This thesis submitted in fulfilment
of the requirements for the degree of
Doctor of Philosophy
(Information Technology)

**College of Computing, Informatics and
Mathematics**

October 2024

ABSTRACT

Ageing is a natural process associated with cognitive decline, an increased risk of chronic health issues, and sensory losses that have emotional consequences, leading to depressive symptoms and an increased suicide risk among the elderly. To support elderly, productive ageing activities using Chatbots offer numerous benefits. However, existing chatbots often fail to engage with elderly emotions effectively. Evoking emotional responses in users has also received less attention in previous chatbot design studies, which have mostly concentrated on usability. Conclusively, past literature has led to three problem statements: the identification of chatbot UI design elements is insufficient to influence the elderly's emotional response, there is a deficiency in addressing the elderly's emotional needs when designing chatbots, and the influence of the elderly's emotional responses on chatbot user interface design (UID) and their connection to the UID component have been disregarded. Therefore, this research addresses four objectives: i) to identify the User Interface design elements of the chatbot design that influence the elderly's emotional responses; ii) to determine the emotional responses that influence the elderly's use of the chatbot; iii) to develop an emotion classification model for chatbot design for the elderly; and iv) to validate the proposed model. This research employed a qualitative methodology using a semi-structured interview approach with ten chatbot design specimens and 30 elderly participants. Three experts were interviewed to validate the model, confirming its potential to promote positive emotional responses in elderly chatbot users. Although all of these outcomes were based on evaluations performed with some limitations and constraints, they provide some novel foundations by proposing elderly emotion classification in Chatbot UID. The key finding is the Emotion Classification Model of Chatbot Design for Elderly development, a novel approach to crafting a chatbot UI design that primarily targets elderly emotional responses. As a conclusion, the Emotion Classification Model of Chatbot Design for Elderly, makes modest theoretical, empirical, and methodological contribution that can be use as reference for UI designer to design a Chabot design based on elderly emotion needs. Future research could investigate the model's applicability using a broader range of subjects, alternative emotion dimensions, additional design elements, new domains, or integration with artificial intelligence (AI) and analytics to strengthen the internal validity of the current findings.

ACKNOWLEDGEMENT

Alhamdulillah. This journey is very lonely, long, and full of challenges. Indeed, the struggles are real. Firstly, I thank God for allowing me to embark on my PhD and complete this almost challenging journey. My deepest gratitude goes to my supervisor, Professor Ts. Dr. Hj. Wan Abdul Rahim Wan Mohd Isa and Professor Ts. Dr. Hj. Anitawati Mohd, for trusting and supporting me throughout this journey. I also extend my special thanks to the Dean, the KPPIM Post Graduate Office, and the IPSIS employees.

Finally, this thesis is dedicated to my beloved parents, Hj Bidin and , and my family siblings, especially my late sister, for their endless support. Lastly, my children, Auni, A'isy, and A'faf, and my lovely soul mate, Azira, for the du'a and love, time, and understanding. Without all of you, this success would not have been possible.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xii
CHAPTER ONE INTRODUCTION	1
1.1 Introduction	1
1.2 Background of the Research	1
1.3 Problem Statement	3
1.4 Research Questions	7
1.5 Research Objectives	7
1.6 Research Scopes	7
1.7 Research Significance	8
CHAPTER TWO LITERATURE REVIEW	10
2.1 Introduction	10
2.2 Elderly Terminology and Life Challenge	10
2.2.1 Enhancing Elderly Well-Being Through Proactive Aging	13
2.3 Chatbot Technology	15
2.3.1 Chatbot in the AI Era	17
2.3.2 The Inclusion of Elderly Engagement with Digital Technology	23
2.3.3 Chatbot UI Design Related Theories	25
2.3.4 Elderly and Chatbot UID Issues	28
2.4 Emotion Terminology and Concepts	31
2.4.1 Emotional Response	33

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This research seeks to highlight how ageing impacts the elderly and how chatbot technology could help the elderly adapt to the impact of the ageing problem. The results of the research would later provide more evidence on how chatbots could assist the elderly in their daily lives, facilitating the creation of more assessment instruments to better understand the emotions of elderly individuals, in addition to laying the groundwork for future research aimed at developing chatbots to assist the elderly in productive activities. Therefore, this research employed qualitative analysis as a methodology to enhance the understanding and knowledge of related issues during the investigation process and to identify the most suitable solution for the elderly. This chapter provides an overview of the current research, where the discussions consist of subtopics such as the background of the research, problem statements, research questions, research objectives, and research significance, as well as research scopes and limitations.

1.2 Background of the Research

The global phenomenon of ageing significantly impacts the physical and psychological well-being of elderly individuals. Common physical health conditions associated with ageing include hearing loss, cataracts, refractive errors, hypertension, musculoskeletal pain (such as back and neck pain and osteoarthritis), chronic obstructive pulmonary disease, and diabetes. Additionally, psychological effects such as loneliness and depression not only pose challenges for assessment but can also have profound consequences. These combined physical and emotional impacts can disrupt older adults' daily routines and adversely affect their overall quality of life.

The escalating global elderly population exacerbates this situation. By 2030, the number of elderly individuals is projected to increase by 15%, with a significant proportion aged 80 years or older living alone (Safian et al., 2021). Without effective interventions, ageing will continue to grow, affecting older adults worldwide. Current