HYBRID ANALYSIS APPROACH USING GRAPHICAL MODEL STRUCTURE LEARNING AND STRUCTURAL EQUATION MODELLING FOR CLOUDIOT-BASED HEALTHCARE ADOPTION MODEL IN JORDAN

By

IYAD MAHMOUD MOHAMMAD ALTAWAIHA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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DEDICATION

To my mother, whose love and sacrifices have been the foundation of my journey. To my brothers and sisters, who have always stood by my side as unwavering support pillars. And to my late father, whose steadfast belief in my abilities and constant encouragement was my guiding light throughout this journey. The values he instilled in me have been my compass, and even in his absence, his teachings and cherished memories have granted me strength, motivation, and resilience. This achievement is more than just mine; it is a testament to his profound love, boundless support, and the sacrifices he made for my dreams. Dad, this one's not just for me; it's for us. I hope it makes you proud, for it carries a part of you within its pages.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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This study addresses a gap in understanding and modeling the factors influencing the adoption of CloudIoT-based healthcare (CIoT-H) technology. Despite the potential of CloudIoT technology to enhance healthcare delivery, its utilization remains limited. To address this, we developed a comprehensive theoretical model that examines healthcare professionals' intentions to adopt CIoT-H, considering technological, individual, organizational, and environmental factors. Given the increasing pressures on global healthcare systems, such as aging populations, rising chronic diseases, and shortages of healthcare professionals, this research is timely and critical. We constructed the model using the Analytic Hierarchy Process (AHP) and employed a quantitative methodology to collect data via questionnaires. Data analysis was conducted using Structural Equation Modeling (SEM) and Graphical Model Structure Learning (GMSL), utilizing SmartPLS and BayesiaLab software tools.

Initial SEM analysis showed that performance expectancy, effort expectancy, facilitating conditions, perceived privacy, trust, and perceived security significantly influenced healthcare professionals' behavioral intentions. Trust also mediated the effects of performance expectancy, perceived security, and effort expectancy on behavioral intention. Subsequently, GMSL was used to build a data-driven model, which revealed three new relationships that were not considered in the proposed model. These relationships were then incorporated into the model, and the SEM analysis was re-conducted to assess the refined model. The result showed that including these relationships improved the model's goodness-of-fit by decreasing the SRMR value from 0.044 to 0.041. The adjusted R^2 value for trust increased from 0.799 to 0.842, indicating increased explanatory power. Meanwhile, the explanatory power for performance expectancy, introduced as a new mediator, achieved an adjusted R^2 of 0.756. Facilitating conditions had the largest effect size on behavioral intention ($f2$=0.031), perceived privacy on trust ($f2$=0.28), and effort expectancy on performance expectancy ($f2$=0.615). Predictive relevance (Q2) was high for all endogenous variables: behavioral intention (0.785), trust (0.837), and performance expectancy (0.755), affirming the GMSL's contribution and the robustness of the refined model.

This study contributes to understanding CIoT-H technology adoption by providing valuable insights into the factors influencing its adoption. Furthermore, this study contributes to the body of knowledge by building a theoretical adoption model using the AHP method, which contains factors derived from four main categories. Additionally, it introduces a hybrid approach that combines SEM and GMSL for model analysis and validation. The findings and novelty presented in this research hold

significant implications for the domain, guiding policymakers, stakeholders, and healthcare institutions in framing their strategies for implementing and optimizing CIoT-H solutions, ultimately contributing to a more effective and efficient healthcare system.

Keywords: Adoption, CloudIoT, Healthcare, Modeling, Technology

SDG: GOAL 3: Good Health and Well-being

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PENDEKATAN ANALISIS HIBRID MENGGUNAKAN PEMBELAJARAN STRUKTUR MODEL GRAFIK DAN PEMODELAN PERSAMAAN STRUKTUR UNTUK MODEL ADOPSI PENJAGAAN KESIHATAN BERASASKAN CLOUDIOT DI JORDAN

Oleh

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Pengerusi : Profesor Madya Ts. Rodziah binti Atan, PhD
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Kajian ini menangani jurang dalam memahami dan memodelkan faktor-faktor yang mempengaruhi penerimaan teknologi penjagaan kesihatan berasaskan CloudIoT (CIoT-H). Walaupun potensi teknologi CloudIoT untuk meningkatkan penyampaian penjagaan kesihatan, penggunaannya masih terhad. Untuk menangani isu ini, kami telah membangunkan model teoretikal yang komprehensif yang mengkaji niat profesional penjagaan kesihatan untuk menerima CIoT-H, dengan mengambil kira faktor teknologi, individu, organisasi, dan persekitaran. Memandangkan tekanan yang semakin meningkat ke atas sistem penjagaan kesihatan global, seperti populasi yang semakin tua, peningkatan penyakit kronik, dan kekurangan profesional penjagaan kesihatan, kajian ini adalah tepat pada masanya dan kritikal. Kami membina model menggunakan Proses Hierarki Analitik (AHP) dan menggunakan metodologi kuantitatif untuk mengumpul data melalui soal selidik. Analisis data dilakukan menggunakan Pemodelan Persamaan Struktural (SEM) dan Pembelajaran Struktur Model Grafik (GMSL), menggunakan alat perisian SmartPLS dan BayesiaLab.

Analisis SEM awal menunjukkan bahawa jangkaan prestasi, jangkaan usaha, keadaan fasilitasi, privasi yang dirasakan, kepercayaan, dan keselamatan yang dirasakan secara signifikan mempengaruhi niat tingkah laku profesional penjagaan kesihatan. Kepercayaan juga menengahi kesan jangkaan prestasi, keselamatan yang dirasakan, dan jangkaan usaha terhadap niat tingkah laku. Selepas itu, GMSL digunakan untuk membina model berasaskan data, yang mendedahkan tiga hubungan baharu yang tidak dipertimbangkan dalam model yang dicadangkan. Hubungan ini kemudiannya dimasukkan ke dalam model, dan analisis SEM dilakukan semula untuk menilai model yang diperhalusi. Keputusan menunjukkan bahawa memasukkan hubungan ini meningkatkan kesesuaian model dengan mengurangkan nilai SRMR daripada 0.044 kepada 0.041. Nilai R^2 yang diselaraskan untuk kepercayaan meningkat daripada 0.799 kepada 0.842, menunjukkan peningkatan kuasa penjelasan. Sementara itu, kuasa penjelasan untuk jangkaan prestasi, yang diperkenalkan sebagai mediator baharu, mencapai R^2 yang diselaraskan sebanyak 0.756. Keadaan fasilitasi mempunyai saiz kesan terbesar terhadap niat tingkah laku ($f2$=0.031), privasi yang dirasakan terhadap kepercayaan ($f2$=0.28), dan jangkaan usaha terhadap jangkaan prestasi ($f2$=0.615). Relevan ramalan (Q2) adalah tinggi untuk semua pemboleh ubah endogen: niat tingkah laku (0.785), kepercayaan (0.837), dan jangkaan prestasi (0.755), mengesahkan sumbangan GMSL dan kekukuhan model yang diperhalusi.

Kajian ini menyumbang kepada pemahaman penerimaan teknologi CIoT-H dengan memberikan pandangan berharga tentang faktor-faktor yang mempengaruhi penerimaannya. Selain itu, kajian ini menyumbang kepada badan pengetahuan dengan membina model penerimaan teoretikal menggunakan kaedah AHP, yang mengandungi faktor-faktor yang diperoleh daripada empat kategori utama. Selain itu,

ia memperkenalkan pendekatan hibrid yang menggabungkan SEM dan GMSL untuk analisis dan pengesahan model. Penemuan dan kebaharuan yang dibentangkan dalam kajian ini mempunyai implikasi yang signifikan untuk domain ini, membimbing pembuat dasar, pihak berkepentingan, dan institusi penjagaan kesihatan dalam merangka strategi mereka untuk melaksanakan dan mengoptimumkan penyelesaian CIoT-H, akhirnya menyumbang kepada sistem penjagaan kesihatan yang lebih berkesan dan efisien.

Kata kunci: CloudIoT, Kesihatan, Pemodelan

SDG: MATLAMAT 3: kesihatan baik dan Kesejahteraan

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ACC	Accessibility
AHP	Analytic Hierarchy Process
AI	Artificial Intelligence
AIMDSS	Artificial Intelligence-based Medical Diagnosis Support Systems
APPA	Average Pairwise Percentage Agreement
AVA	Availability
AVE	Average Variance Extracted
AWR	Awareness
BDAS	Big Data Analytic Systems
BI	Behavioral Intention
CA	Cronbach's Alpha
CB-SEM	Covariance-Based Structural Equation Modeling
CC	Cloud Computing
CI	Consistency Index
CIoT-HA	CloudIoT-based Healthcare Adoption
CIoT-H	CloudIoT-based Healthcare
CLW	Category Local weight
COM	Compatibility
CR	Consistency Ratio
CRe	Composite Reliability
DAG	Directed Acyclic Graph
DEMATEL	Decision-Making Trial and Evaluation Laboratory
DOI	Diffusion of Innovation
EE	Effort Expectancy
EHP	eHealth Policy

EHRs	Electronic Health Records
EM	Expectation-Maximization
EMRs	Electronic Medical Records
EPR	External Pressure
EQ	Equivalence Class Search
ESF	Environmental Specific Factors
f^2	effect size
FC	Facilitating Conditions
FGW	Factor Global Weight
FLW	Factor Local Weight
GMSL	Graphical Model Structure Learning
GS	Government Support
HAC	Hierarchical Agglomerative Clustering
HB	Habit
HBM	Health Belief Model
HCPs	Healthcare Professionals
HCRs	Healthcare Recipients
HIS	Health Information Systems
HM	Hedonic Motivation
ICDDSS	Intelligent Clinical Diagnostic Decision Support Systems
ICT	Information and Communications Technology
IoT	Internet of Things
ISF	Individual Specific Factors
MCDM	Multi-Criteria Decision-Making
MGA	Multi-Group Analysis
mHealth	Mobile Health
MICOM	Measurement Invariance of Composite Models

MWST	Maximum Weight Spanning Tree
NGOs	Non-Governmental Organizations
NIS	Negative Ideal Solution
OS	Organizational Support
OSF	Organizational Specific Factors
PE	Performance Expectancy
PI	Personal Innovativeness
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares-Based Structural Equation Modeling
PIS	Positive Ideal Solution
PPR	Perceived Privacy
PR	Perceived Risk
PSE	Perceived Security
PV	Price Value
Q^2	predictive relevance
QoS	Quality of Service
R^2	coefficient of determination
REL	Reliability
RI	Random Index
SE	Self-efficacy
SEM	Structural Equation Modeling
SI	Social Influence
SLR	Systematic Literature Review
SPSS	Statistical Package for the Social Sciences
SRC	Staff Resistance to Change
SRMR	Standardized Root Mean Square Residual
TA	Technology Anxiety

TAM	Technology Acceptance Model
TCM	Task Complexity
TOE	Technology Organization Environment
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution
TPB	Theory of Planned Behavior
TR	Trust
TRA	Theory of Reasoned Action
TSF	Technology-Specific Factors
TTF	Task Technology Fit
UNRWA	United Nations Relief and Works Agency for Palestine Refugees
UTAUT	Unified Theory of Acceptance and Use of Technology
UTAUT2	Unified Theory of Acceptance and Use of Technology 2
VIF	Variation Indicator Factor

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter presents an overview and motivation of the research, problem statement, research questions, and objectives. Additionally, the significance and contributions of the study are discussed. The chapter concludes by outlining the structure of the thesis.

1.2 Overview and Motivation

The significance of technology in improving different aspects of living these days cannot be understated. The term "digital transformation," known as "digitalization," refers to using technology for improvement, simplification, and innovation (Pihir et al., 2019). Digitization has the potential to improve service provision in all spheres of society while simultaneously boosting productivity (Kagermann, 2015; Pihir et al., 2019). The widespread outbreak of the COVID-19 pandemic worldwide has revealed the significance of digitalization in all spheres of business and society (Iivari et al., 2020). The pandemic has harmed our lives and businesses, tested our social resilience, and altered our way of life. Among the most severely impacted sectors is healthcare, which revealed vulnerabilities in design and preparedness for handling such crises (Blumenthal et al., 2020).

Even before the emergence of COVID-19, healthcare systems around the world were grappling with the challenges posed by an aging population, the rise of chronic and lifestyle-related diseases, shortages of medical professionals, and the costs associated with addressing these issues (Gulland, 2013; Hiasat, 2019; Madae et al., 2018).

Moreover, the healthcare system confronts the difficulty of staying up to date in an arena where technology, medical information, and partnerships with other healthcare systems are all in perpetual change (Cohen et al., 2004; Kelly & Young, 2017; Thakur et al., 2012). Innovation is crucial for meeting the increasing demand for higher-quality, more efficient healthcare services (Thakur et al., 2012). Additionally, advances in healthcare and technology enable promising opportunities for state-of-the-art medical practices (Kelly & Young, 2017). Thus, the widespread adoption of technological advancements may drive the delivery of higher-quality, more cost-effective healthcare services.

In recent decades, there has been a growing focus on healthcare technology due to its potential to improve the quality of healthcare services and address the challenges faced by traditional healthcare systems. Generally, the use of technology in the healthcare field is referred to as eHealth (Harrison & Lee, 2006); eHealth offers numerous benefits, such as enhanced information exchange and improved healthcare quality. Despite these benefits, current eHealth systems face several challenges, such as device heterogeneity, restricted processing capabilities, and the need for expansive storage capacity to handle a vast volume of data (Aceto et al., 2020). Nonetheless, the latest trends in technology present potential solutions to these challenges.

The CloudIoT-based healthcare (CIoT-H) paradigm integrates connectivity technologies, applications, sensors, cloud services, and individuals into a cohesive, intelligent system for patient monitoring and secure record storage, enabling continuous treatment and analysis (Farahani et al., 2018). This innovative paradigm allows real-time monitoring of patient's vital signs, potentially saving lives by facilitating early detection and prediction of abnormal conditions. Moreover,

examining patients' medical records aids in preemptive disease prevention and management (Darwish et al., 2019).

One of the most salient advantages of this paradigm lies in its capacity to deliver ubiquitous, cost-effective, and high-quality healthcare services (Shah & Bhat, 2020). Moreover, the CIoT-H paradigm streamlines the diagnostic process, offers real-time insights on health indicators, ensures patient prescriptions adherence, and generates alerts concerning abnormal patient conditions (Darwish et al., 2019; Shah et al., 2022). This innovative paradigm empowers remote patient monitoring systems to access, monitor, and care for patients irrespective of their geographic location (Shah et al., 2022).

Despite the potential benefits of CIoT-H technology in revolutionizing patient care, enhancing medical decision-making, and fostering a more resilient and accessible healthcare system, its adoption among Healthcare Professionals (HCPs) remains limited. To address this discrepancy, this study explores the factors influencing HCPs' adoption of this technology.

The findings of this study will provide valuable insights for a diverse range of stakeholders, including healthcare organizations, technology developers, and policymakers. This research will lay the groundwork for designing and implementing strategies and interventions to improve the acceptance and utilization of CIoT-H technology by highlighting the factors that drive its adoption.

The insights gleaned from this study will hopefully enrich the ongoing discourse on technology adoption within the healthcare landscape, fostering a more nuanced

understanding of how innovative technologies can be seamlessly integrated into healthcare systems. This study will serve as a guiding light toward harnessing the potential of CIoT-H technology by addressing the factors that shape healthcare professionals' adoption of this technology.

1.3 Problem Statement

Healthcare systems worldwide have been having trouble keeping up with the demands of an aging population, the rise of chronic and lifestyle diseases, and the shortage of HCPs (Gulland, 2013; Hiasat, 2019; Madae et al., 2018). These public issues are raising healthcare costs and, thus, growing inequality between various social groups and countries with varying economic levels in healthcare provision. An example is the COVID-19 outbreak that put severe pressure on the healthcare systems around the world (Tanne et al., 2020). The pandemic has harmed our lives and businesses, put our social resilience to the test, and altered our way of life. Our healthcare system was one of the most affected sectors, and the results have indicated that it was not designed and equipped to handle such crises (Blumenthal et al., 2020). eHealth technologies, particularly CIoT-H technology paradigm, hold great potential to address these challenges by improving service quality, reducing medical errors, and facilitating resource management (Bagherzadeh et al., 2020; Darwish et al., 2019; Shah et al., 2022).

Despite the acknowledged potential of CIoT-H, its integration into healthcare practices is still emerging (Botta et al., 2016; Darwish et al., 2019; Shah et al., 2022). The existing literature on CIoT-H technology focuses on the technical aspects, with less emphasis on understanding how HCPs adopt this technology. This is a pivotal

concern, as HCPs play an essential role in the effective deployment and utilization of eHealth technologies, directly influencing the success of these innovations in healthcare settings (Al-Rawashdeh et al., 2022; Kalayou et al., 2020).

Additionally, current technology adoption models have concentrated mainly on cognitive factors, neglecting the comprehensive range of influences, including emotional aspects and other categories that affect HCPs' decisions to adopt new technologies (Lai, 2017). This indicates a need for a more inclusive model that addresses the diverse dimensions influencing HCPs to adopt CIoT-H.

Furthermore, the common use of Structural Equation Modeling (SEM) alone in analyzing technology adoption factors suggests a methodological limitation. SEM may not fully capture the intricate dynamics of the adoption process. The current study proposes a hybrid methodology that integrates Graphical Model Structure Learning (GMSL) with SEM to address this limitation. This approach is necessary due to the complex interplay among factors affecting HCPs' adoption of CIoT-H. The goal is to provide a deeper and more comprehensive understanding of these factors, including individual, organizational, environmental, and technological influences. Incorporating GMSL in this research will reveal underlying patterns and relationships that might remain hidden under conventional analysis techniques.

Therefore, this research is proposed to address these critical gaps and seeks to enhance the understanding of CIoT-H adoption, contributing to broader acceptance, more effective implementation, and ultimately improving healthcare delivery and patient outcomes.

1.4 Research Questions

To address the gaps highlighted in the literature, this study focuses on building a model to study the factors influencing HCPs' intention to adopt CIoT-H. The research questions are as follows:

1. What are the key factors that influence HCPs' intention to adopt CIoT-H technology, and how can these factors be analytically identified?
2. How do the mediator and moderating variables influence HCPs' intention to adopt CIoT-H?
3. How can a model for the adoption of CIoT-H technology be developed?
4. How can the proposed model for CIoT-H adoption be validated?

1.5 Research Objectives

This research aims to design and develop a model that supports the adoption of CloudIoT technology in the healthcare sector by identifying the factors influencing the adoption intention of this technology from HCPs' perspectives. The following are the specific objectives of this research:

1. To identify factors significantly influencing HCPs' intention to adopt CIoT-H technology using an analytical method.
2. To analyze the influence of mediator and moderator variables on HCPs' intention to adopt CIoT-H technology.
3. To develop a model for HCPs' adoption of CIoT-H technology.
4. To validate the proposed model for CIoT-H adoption using appropriate data collection and analysis methods.

1.6 Research Contribution

Evidence in the literature suggests that developing countries lag behind industrialized ones when it comes to adopting cutting-edge technologies (Idoga et al., 2018). Additionally, few research studies have been conducted on CloudIoT technology adoption in developing countries like Jordan. Therefore, this study might contribute significantly by providing helpful and validated insights into adopting CIoT-H for developing countries like Jordan. Moreover, establishing a theoretical model centered on HCPs' intentions to understand better the adoption of CIoT-H remains unexplored in the literature. Prior research has been chiefly on CloudIoT characteristics and systems designs. Most previous studies have overlooked HCPs' adoption of this technology. Therefore, the main contribution of this study is a theoretical adoption model, which is considered a beneficial tool to guide and support the adoption of CIoT-H.

Existing models of technology adoption have been criticized for their concentrating on cognitive factors and overlooking the impacts or emotions of individuals as factors of technology adoption, which are critical in driving technology adoption (Hoff et al., 2012; Kulviwat et al., 2007). These models' predominant focus on cognitive attributes often results in an incomplete understanding of technology adoption, as they fail to account for the full range of factors that influence individuals' technology adoption behaviors. In response to these shortcomings, our research intends to contribute to the existing body of knowledge by developing a model for CIoT-H adoption grounded on an analytical process. This model encompasses factors drawn from four primary categories: technological, individual, organizational, and environmental.

We will employ GMSL to counteract the limitations in traditional methodologies, especially regarding model creation, model structure improvement, and the enhancement of model evaluation metrics. Given that our model is grounded in pre-existing knowledge, GMSL will be used in this research to improve the model structure and the model evaluation metrics. Therefore, an additional contribution of this study lies in introducing a new approach for analyzing and validating the proposed model. This hybrid approach combines the advantages of GMSL and SEM approaches.

Through employing an analytical method for building the model together with GMSL and SEM for analyzing and validating the model, this research seeks to develop a robust model that explains the adoption intention of the CIoT-H technology. This model will consider various technological, individual, organizational, and environmental factors to provide valuable insights for stakeholders working with CIoT-H technology, as will be detailed further in this thesis. Thus, it will help to understand HCPs' preferences and needs towards facilitating the adoption of the CIoT-H technology.

1.7 Research Scope

This study investigates the adoption intentions of CIoT-H technology for smart healthcare. CIoT-H has the potential to revolutionize healthcare through its widespread, cost-effective, and high-quality services. The primary objective is to enhance understanding of the factors that influence the adoption of the CIoT-H technology. To this end, the Analytic Hierarchy Process (AHP) is employed to

prioritize these factors, serving as the groundwork for building a model that explores the determinants of CIoT-H adoption intention.

This research examines the relationships between variables by employing a hybrid approach of GMSL and SEM approaches. Set within the unique healthcare context of Jordan, this research aims to provide insightful perspectives on the adoption of CIoT-H technology in a developing country, offering valuable implications for similar contexts on a global scale. The study population comprises HCPs working within Jordanian hospitals, explicitly including physicians, nurses, pharmacists, and lab technicians. These individuals are integral to the CIoT-H adoption process, as their direct engagement with and acceptance of this technology are crucial for its successful implementation and utilization in healthcare practices.

Through exploring the determinants of CIoT-H adoption, the research aims to contribute to the development of a more effective, efficient, and responsive healthcare system. The insights gained from this study are intended to guide policymakers, healthcare practitioners, and technology developers toward creating a more interconnected and patient-centric healthcare environment in Jordan and similar settings worldwide.

1.8 Research Significance

The significance of this study stems from its examination of the factors influencing the intention to adopt CIoT-H within the context of a developing country, namely Jordan. Prior studies have predominantly focused on the technical aspects of CloudIoT technology and its implementation in industrialized nations. This research addresses a

gap in the existing literature by investigating the adoption of this technology in a developing country. The study offers valuable insights to enhance our understanding of the opportunities in such environments.

This research also highlights the importance of considering multiple dimensions when studying technology adoption. Through constructing a model using the AHP method, which incorporates factors from technological, individual, organizational, and environmental categories, the study presents a comprehensive approach to understanding the adoption intention of CIoT-H. This approach is significant for future research, policymakers, healthcare organizations, designers, and developers in understanding drivers for the adoption intention.

Additionally, the insights derived from this study will contribute to the ongoing discourse on technology adoption within the healthcare sector, promoting a more designated approach to how innovative technologies can be effectively integrated into healthcare systems. This study's examination of factors that influence HCPs' adoption intention of CIoT-H technology provides insights into how to integrate this technology into the healthcare setting successfully. This will eventually lead to improved patient care, effective medical decision-making, and a more robust and inclusive healthcare system for all societal members.

Lastly, the significance of the study is augmented by the combination of GMSL and SEM in the analysis and validation of the model. This hybrid approach, employed to study HCPs' adoption intention of CIoT-H, offers a reliable approach to studying technology adoption. Its application could potentially extend to various contexts and different technologies.

1.9 Thesis Structure

The thesis consists of six chapters, each building upon the previous and paving the way for the next, which forms a coherent narrative that investigates the adoption intention of CloudIoT in the healthcare sector.

Chapter 1 is the introduction that paves the way for the research and establishes a robust foundation for the study. It presents the research problem, raising questions that guide the study's direction. It also shows the research's scope, contribution, and significance and outlines the thesis structure.

Chapter 2 systematically examines the existing literature related to CloudIoT technology and its integration into healthcare. Through a detailed exploration of previous research and theories, this chapter outlines the research landscape and analyzes the research gap. The chapter concludes by collecting several factors that will guide the subsequent methodology and model development.

Chapter 3 provides a roadmap for the research process. It describes the philosophical underpinnings of the study and the research approach and method adopted. It also presents a comprehensive operational framework encompassing all research stages, including literature review, model development, data collection and model validation, and results and discussion. The chapter also addresses the ethical considerations in conducting this research.

Chapter 4 weaves the threads of the previous chapters into a tangible model that can be empirically examined. Building upon the findings from the literature review and guided by the methodology, this chapter presents the model development process and

outcomes. This includes expert reviews, a pilot study, and discussions on hypothesis development. This chapter also describes the data collection process, which marks a crucial point in the research as it transitions from theoretical exploration to empirical investigation.

Chapter 5 covers the results and discussion of the research. It forms the core of the thesis, showing the fruits of the study's work. The chapter analyzes the collected data, analyzes the proposed model through a hybrid analytical approach, tests the hypotheses, offers insights, and deepens understanding of the CIoT-H adoption behavior. The analytical process validates the proposed model and illustrates facets of the adoption behavior, contributing to the body of knowledge on CIoT-H.

Finally, Chapter 6, the conclusion and future work, brings closure to the research efforts. It presents an overview of the study, highlighting its theoretical and practical contributions. In addition, the chapter discusses potential avenues for future research, outlining the study's limitations and emphasizing the fulfillment of research objectives. It also synthesizes the key findings, effectively concluding the thesis.

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