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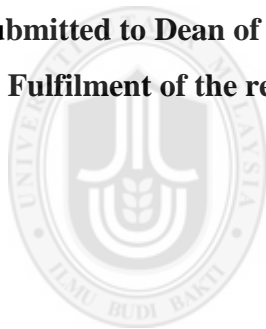
**REQUIREMENT MODELING FOR DATA WAREHOUSE USING  
GOAL-UML APPROACH: THE CASE OF HEALTH CARE**



**MASTER OF SCIENCE (INFORMATION TECHNOLOGY)  
UNIVERSITI UTARA MALAYSIA  
2017**

**REQUIREMENT MODELING FOR DATA WAREHOUSE USING  
GOAL-UML APPROACH: THE CASE OF HEALTH CARE**

**A Thesis submitted to Dean of Awang Had Salleh Graduate School of Arts and Sciences  
in Partial Fulfilment of the requirement for degree Master of Science in Information  
Technology**



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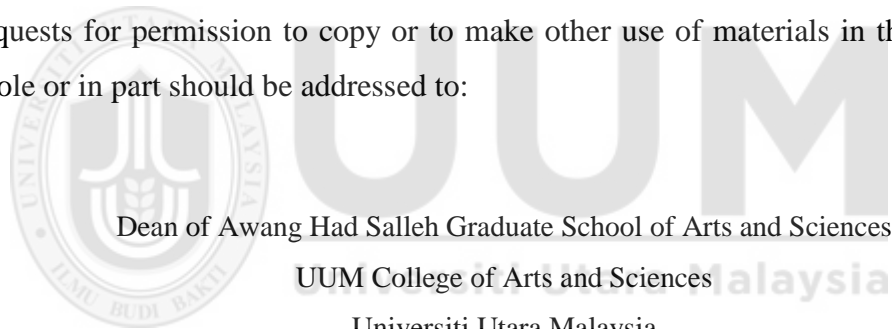
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## Abstrak

Pembuat keputusan menggunakan Gudang Data (DW) untuk melaksanakan analisis pada maklumat perniagaan. Pembangunan DW adalah satu proses yang panjang dengan risiko kegagalan yang tinggi dan sukar untuk menganggarkan keperluan untuk membuat keputusan pada masa depan. Tambahan, reka bentuk DW semasa tidak mengambil kira analisis keperluan awal dan akhir semasa pembangunannya khususnya dengan menggunakan pendekatan *Unified Modeling Language* (UML). Berdasarkan masalah ini, adalah penting untuk pendekatan pemodelan DW semasa merangkumi kedua-dua analisis keperluan awal dan akhir dalam reka bentuk DW. Satu kajian kes telah dijalankan ke atas Penjagaan Kesihatan Luar Bandar, Malaysia (MRH) untuk mengumpul keperluan reka bentuk DW. Pendekatan berorientasikan matlamat telah digunakan untuk menganalisis keperluan awal dan kemudian dipetakan kepada pendekatan UML untuk menghasilkan model DW baharu yang dipanggil Goal-UML (G-UML). Pendekatan yang disyorkan menekankan proses pemetaan skema konseptual DW kepada gambar rajah kelas untuk menghasilkan reka bentuk MRH-DW yang lengkap. Ketepatan reka bentuk DW itu dinilai melalui ulasan pakar. Kaedah G-UML boleh menyumbang kepada pembangunan DW dan menjadi garis panduan kepada pembangun DW untuk menghasilkan reka bentuk DW yang baik serta memenuhi semua keperluan pengguna.

Kata kunci: gudang data, orientasi-matlamat, skema konseptual, kelas rajah, keperluan



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## Abstract

Decision makers use Data Warehouse (DW) for performing analysis on business information. DW development is a long term process with high risk of failure and it is difficult to estimate the future requirements for the decision-making. Further, the current DW design does not consider the early and late requirements analysis during its development, especially by using Unified Modeling Language (UML) approach. Due to this problem, it is crucial that current DW modeling approaches covered both early and late requirements analysis in the DW design. A case study was conducted on Malaysia Rural Health Care (MRH) to gather the requirements for DW design. The goal-oriented approach has been used to analyze the early requirements and later was mapped to UML approach to produce a new DW modeling called Goal-UML (G-UML). The proposed approach highlighted the mapping process of DW conceptual schema to a class diagram to produce a complete MRH-DW design. The correctness of the DW design was evaluated using expert reviews. The G-UML method can contribute to the development of DW and be a guideline to the DW developers to produce an improved DW design that meets all the user requirements.

Keywords: data warehouse, goal-oriented, conceptual schema, class diagram, requirement



## **Acknowledgement**

Alhamdulillah. First and foremost, all praise and thanks to Allah for giving me the strength and patience, and providing me the knowledge to accomplish this thesis. And, special dedication to my beloved father, mother and family members.

This thesis would not have been possible without the support of many people. First, I wish to express my gratitude to my supervisors, Dr. Azman Ta'a and Dr. Azizah Ahmad, who abundantly helpful and offered invaluable assistance support and guidance. My sincere thanks must also go to the members of my Viva committee: Dr. Norliza Katuk, Assoc. Prof. Dr. Haslina Mohd, and Dr. Sharhida Zawani Saad, for useful comments and suggestions to improve my thesis. Deepest gratitude to Dr. Norliza Katuk and Mdm Nor Ma and all friends those without their assistance, this study would not have been successful.

I would also like to thank all my brothers and sister for their support.

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## List of Abbreviations

DW	Data Warehouse
MOH	Ministry of Health
NGO	non-government organization
MCH	Mother Child Health Care
OPD	Outpatient Department
ER	Entity Relationship
UML	Unified Modeling Language
NFR	Nonfunctional requirement
G-UML	Goal and UML
RE	Requirement Engineering
BO	Business Object
GOODM	Graph Object Oriented Multidimensional Data
AGDI	Agent-Goal-Decision-Information
OLAP	Online Analytical Processing
CRUD	Create, Read, Update, Delete
ETL	Extraction-Transformation-Loading
GRAnD	Goal-oriented Requirement Analysis for Data Warehouse
SD	Strategic Dependency
SR	Strategic Rationale
GOMA	Goal-oriented Modeling Approach
AGORA	Annotated Goal-Oriented Requirements Analysis
GRL	Goal Requirement Language
GBRAM	Goal-Based Requirements Analysis Method
KAOS	Knowledge Acquisition in automated specification
GORE	Goal-oriented Requirement
MDA	Model Driven Architecture
CIM	Computation Independent Model
PIM	Platform Independent Model
3NF	Third Normal Form
UP	Unified Process
OCL	Object Constraint Language
ETL	Extract, Transform and Load
PSM	Platform Specific Models
KVB	KassenärztlicheVereinigung Bayern, Bavarian Association of Statutory Health Insurance Physicians
HITV	Health Insurance Treatment Voucher
DFM	Dimensional Fact Model
FK	Foreign Key
OME	Organization Modeling Environment
MEAA	Maybank Electronic Application Accommodation
EOS	Enterprise Origination System
MRH	Malaysia Rural Health Care

# CHAPTER ONE

## INTRODUCTION

### 1.1 Introduction

This chapter serves as the introductory part of this study. It includes the objectives of the study, the background of study, problem statement, scope and limitation of the research and research significance that need to be gained in this study. In summary, this study is laid for further discussion on how goal-oriented and UML modeling approach contribute to develop DW requirement modeling based on Rural Health Care.

### 1.2 Background of the Study

Data Warehouse (DW) is decision support systems that are specifically derived for the business environment. It's used mainly by decision maker in organization to improve decision making system and increase organization performance. DW contain multiple databases that stores and organizes enterprise-wide data based on large amount of data integrated from heterogeneous sources (Sharma & Jain, 2013). It helps to enhance data access for analysis and decision making that can be used to deduce useful information in systematic way.

As in other information systems, requirements analysis phase is one of important phase that might influence all the phases in DW development. Requirement analysis phase help to identify accurate end users that represent requirements in different way and to reduce risk of DW failure. The main objective of requirement analysis phase

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