

"DATABASE DESIGN AND DEVELOPMENT OF A GUI TOOL"

PROJECT NUMBER : CS/153

PROJECT REPORT SUBMITTED BY:

Maria G. Pitharidou

In partial fulfillment of the requirements  
for award of the diploma  
in Computer Studies Department  
of Higher Technical Institute, Nicosia - Cyprus  
June 1996

PROJECT SUPERVISOR :

Mrs Maria Theodorou  
BSc, MBA (IS)  
Computer Science Lecturer in the  
Computer Studies Department of  
Higher Technical Institute  
Nicosia, Cyprus

2619

## 1. Introduction

This project mainly concerns the design and implementation of a graphical user interface tool that will enable the user of the system to construct Entity-Relationship (ER) Diagrams, and then, the system itself, will be able to "translate" these diagrams and automatically derive the corresponding database relations. It is considered an interesting project and a worth developing system because it will be an important aid for everyone involved in the design and construction of databases and also because it gives to the designer (of the project) the opportunity to get involved with windows programming and experience herself in this field.

The project also involves and a number of other facilities, further than the Entity-Relationship Diagrams construction tool, that will be explained later on during the analysis of the project objectives.

---

## Table of Contents

### Acknowledgements

	page
1.Introduction.....	1
1.1. Following a technique.....	2
2. Investigation Phase.....	4
2.1. Initial Investigation.....	4
2.1.1. Narrative Overview.....	4
2.1.2. System Requirements Overview.....	4
2.1.3. Security Measures.....	5
2.1.4. Software Requirements.....	5
2.1.5. Hardware Requirements.....	5
2.1.6. Information Gathering Limitations.....	6
2.1.7. Selection of Language.....	6
2.1.8. Recommendation.....	12
2.2. Feasibility Study.....	13
2.2.1. Financial Feasibility.....	13
2.2.1.1. Costs Analysis.....	14
2.2.1.2. Benefits Analysis.....	16
2.2.2. Operational Feasibility.....	19
2.2.3. Technical Feasibility.....	19
2.2.4. Human Factors Feasibility.....	19
2.2.5. Schedule Feasibility.....	19

## Table of Contents

---

	page
3. Analysis and General Design Phase.....	22
3.1. Existing System Review.....	22
3.1.1. Introduction to Databases.....	22
3.1.2. Modeling.....	26
3.1.3. Definition of a relation.....	28
3.1.4. Definition of a relational database.....	29
3.1.5. The Information Architecture for a Database Management System.....	30
3.1.5.1. The three schemas.....	31
3.1.5.2. The importance of the information architecture.....	32
3.1.6. The Entity-Relationship Model.....	33
3.1.6.1. Entity-Relationship model concepts.....	33
3.1.6.1.1. Entities and Attributes.....	33
3.1.6.1.2. Relationships.....	34
3.1.6.1.3. Cardinality ratio and Participation constraints.....	35
3.1.6.1.4. Structural Constraints (min,max).....	36
3.1.6.1.5. Weak entity types.....	37
3.1.7. Methodologies.....	38
3.1.7.1. ER Diagrams - Methodology 1.....	39
3.1.7.2. ER Occurrence Diagram & ER Type Diagram - Methodologies 2 & 3.....	53
3.1.7.3. The MERISE Diagramming Technique - Methodology 4.....	66
3.1.7.4. Other Methodologies.....	74
3.1.7.4.1. Methodology 5.....	74
3.1.7.4.2. Methodology 6.....	76
3.1.7.5. Object-Relationship Diagrams.....	77

## Table of Contents

---

	page
3.1.8. Enhanced Entity Relationship Diagrams.....	86
3.1.8.1. Subclasses and Superclasses.....	86
3.1.8.2. Attribute Inheritance in superclass/subclass relationships.....	87
3.1.8.3. Use of Subclasses in Data Modeling.....	87
3.1.8.4. Specialization.....	88
3.1.8.5. Generalization.....	90
3.1.8.6. Constraints on Specialization and Generalization.....	92
3.1.9. Functional Dependencies.....	98
3.1.10. Normalization.....	106
3.2. New System requirements.....	121
3.2.1. Overview Narrative.....	121
3.2.2. System Function.....	121
3.2.3. Outputs to the user.....	122
3.2.4. Inputs to the system.....	122
3.2.5. User requirements.....	122
3.2.5.1. Analysis of Main Objectives.....	123
3.2.5.1.1. Objective 1.....	123
3.2.5.1.2. Objective 2.....	123
3.2.5.1.3. Objective 3.....	124
3.2.5.1.4. Objective 4.....	124
3.2.5.1.5. Objective 5.....	125
3.2.5.1.6. Objective 6.....	125
3.2.5.1.3. Analysis of Secondary Objectives.....	126
3.3. Files Design.....	127

## APPENDICES

Appendix A : The Systems Development Life Cycle.....	149
Appendix B : Database Management System Objectives.....	154
Appendix C : Simple and Complex Relationships.....	156
Appendix D : SQL - Structured Query Language.....	158
Appendix E : References.....	171