AVOIDING SCHEMA CHANGE

&

A FRAMEWORK FOR NON-DISRUPTIVE SCHEMA EVOLUTION

MASTER OF BUSINESS ADMINISTRATION

IN

INFORMATION TECHNOLOGY

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By

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Declaration

"I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any University to the best of my knowledge and believe it does not contain any material previously published, written or orally communicated by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organizations"

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To the best of my knowledge, the above particulars are correct.

Supervisor: ……

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BSc Eng (Moratuwa), MSc (Lough), PhD (Lough), CEng, MIE(SL)

Abstract

It is a well-known fact that a significant share of the cost of information systems is spent on maintenance. Some researchers estimate this share to be around 80% of the lifetime cost of information systems. A significant share of adaptive maintenance work of a business information system starts from a change in the data models it is based on. Since, almost all business information systems are based on relational databases, it is clear that relational database schema changes account for a significant share of the total maintenance cost. This is aggravated by the fact that a change in database schema has the potential of driving existing applications out of date. Modifications to such applications cost a considerable of time and money to business organisations.

Possible solutions to minimize the costs associated with this problem are essentially technical in nature. This dissertation explores a couple of possible solutions in relational database technology, which could help organisations to keep their system maintenance cost under check. The main solutions explored are in the area of data model patterns and schema evolution. A new branch of schema evolution called “Non Disruptive Schema Evolution” is explored as well.

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List of Abbreviations

CRUD	Create, Retrieve, Update, Delete
DBA	Data Base Administrator
DBMS	Data Base Management System
DDL	Data Definition Language
ER	Entity Relationship
ERP	Enterprise Resourse Planning
GUI	Graphical User Interface
IT	Information Technology
NDSE	Non Disruptive Schema Evolution
OR	Object-Relational
RDBMS	Relational DataBase Management System
SDLC	System Development Life Cycle
SQL	Structured Query Language
XML	eXtensible Markup Language

Executive Summary

Business organisations spend a considerable amount of time and money upgrading applications when the schema of a central relational database changes. Currently there is no widely accepted, commercially viable solution for this problem other than living with it. The objective of this research project was to investigate alternative, low cost strategies available to business organisations to deal with the problems caused by schema changes in relational databases.

The possibility of using data model patterns (can be thought of as the equivalent of design patterns in Object Oriented software design), to avoid or minimize schema changes was investigated. It was successfully demonstrated that an already published data model pattern ("New Properties") could facilitate adding a new property to an entity without requiring a change in the database schema. Further the model pattern "Flexible Item" was identified and documented to achieve the same objective while addressing certain limitations of the former.

The practical implication of this is that, if in the business analysis of a new system, if a particular entity is identified as being very critical to the system and having a possibility of needing more attributes in the future, one of the two data model patterns discussed in this dissertation could be selected for use.

Further, a conceptual framework for future research on and area that we call "Non Disruptive Schema Evolution"

was identified and provided. This can be thought of as an extension of traditional schema evolution, with the added feature that, a particular change to the schema will not render any application invalid.

In conclusion, it is evident that there are simple, low cost and formal techniques of addressing the problem of schema changes in relational database, than what the contemporary thinking suggest.