INTEGRATED DSS FOR CONSTRUCTION COST MANAGEMENT USING RELATIONAL DBMS AND FUZZY LOGIC

By

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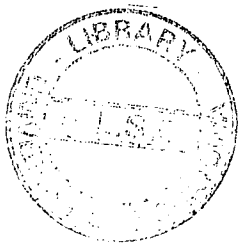

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Dedication

To My Parents

For their continuous dedication and encouragement for all the endeavours towards my advancement.

Declaration

This thesis is a report on the research work carried out in the Department of Civil Engineering, University of Moratuwa, Sri Lanka, during July 2001 to July 2003. This submission is original and does not have any materials previously published or written by any others anywhere, except where citing is made.

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Abstract

Construction Cost Management encompasses and embraces estimating, scheduling, cost control, resource costing, and interim billing, which are highly interconnected to each other, and share data. Also produces very large quantity of information thus necessitates an integrated information system for effective management. Additionally, data related to progress control exhibits imprecision, vagueness and subjectivity, that demands some sophisticated approach to be introduced in the system for predictions and corrective acting in progress control. Advanced systems using current state-of-the-art could be developed to address the problems. But, construction organizations cannot afford to procure such system due to high cost involvement, therefore expects a cost effective solution.

Through an extensive literature review Schedule activity as the denominator, relational DBMS, and Fuzzy logic were identified as suitable method and tools for data integration and vagueness handling. MS Access™, MS project™, and MATLAB™ also identified as cost effective software for physical design. Then, an integrated Decision Support System (DSS) complementing a common database, a scheduler, and a knowledge base was supposed to solve the problem.

Interviews, documentary surveys, and questionnaire surveys were adopted as research techniques. By analyzing the survey data and information, terms and references of the proposed DSS, system architecture, process models, data models and logical models of common database, knowledge representation model for knowledgebase, and dynamic data exchange model for data transfer and conversation were designed. Then MS Access™, MS project™, and MATLAB™ were used to develop the proposed DSS. Finally the developed system was tested for its feasibility in terms of technique and function, and accuracy. Data transfer between database, scheduler, and knowledgebase was very successful. The output produced by the DBMS, and Scheduler had an accuracy of 100 % while Knowledge Based System (KBS) had 80%.

It is proved that general software like MS Access™ and MS project™ have potential for advanced integrated system development with higher technical, functional, and cost feasibilities using relational database concept. They can also be integrated with KBS for heuristic decision making.

Key Words: Cost Management ,Integration, Relational DBMS, Fuzzy Logic, Information System

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Abbreviations

DSS - Decision Support System

DBMS - Database Management System

KBS - Knowledge-Based System

BOQ - Bill Of Quantities

WBS - Work Breakdown Structure

CBS - Cost Breakdown Structure

OBS - Organisation Breakdown Structure

DCBS - Design Component Breakdown Structure

WABS - Work Area Breakdown Structure

BOD - Basic Construction Operation required by Design object

WP - Work Package

PEC - Primitive Elements of Construction

PBS - Project Breakdown Structure

ABC - Activity-Based Costing

CICA - The Construction Industry Computer Association

IT - Information Technology

CAD - Computer Aided Designing

DFD - Data Flow Diagram

ERD - Entity Relationship Diagram

DDE - Dynamic Data Exchange

OLE - Object Embedding and Linking

AI - Artificial Intelligence

GUI - Graphical User Interface

FIS - Fuzzy Inference System