



**An Approach  
to Computer-based  
Knowledge Representation  
for the Business Environment  
using Empirical Modelling**

by  
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*To my parents  
and  
every member of the family*

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\* \* \* \* \*

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## Declarations

This thesis is presented in accordance with the regulations for the degree of Doctor of Philosophy. It has been composed by myself and has not been submitted in any previous application for any degree. The work in this thesis has been undertaken by myself except where otherwise stated. Significant ideas in this thesis have appeared in:

- S. Rasmequan, C. Roe, and S. Russ. Strategic decision support systems: an experience-based approach. In *Proc. of the 18th IASTED Conference on Applied Informatics*, 14-17 February, Innsbruck, Austria, 2000 [Rasmequan<sup>+00a</sup>].

- W. M. Beynon, S. Rasmequan, and S. Russ. The use of interactive situation models for the development of business solutions. In *Proc. of the Workshop on Business Information Research*, University of Rostock, Rostock, Germany, March 2000 [Beynon<sup>+00a</sup>].

- S. Rasmequan and S. Russ. Cognitive artefacts for decision support. In *Proc. of the 2000 IEEE International Conference on Systems, Man & Cybernetics*, 8-11 October, Tennessee, USA, 2000 [Rasmequan<sup>+00b</sup>].

A further paper, 'A New Paradigm for Computer-based Decision Support' [Beynon<sup>+02</sup>] has been accepted for the Special Issue of the Decision Support Systems: the International Journal, on the theme 'New Directions for Decision Support Systems', which is forthcoming.

During the research work associated with this thesis, two other publications were written jointly by the author and other members of the Empirical Modelling group: [Beynon<sup>+00b</sup>, Beynon<sup>+01a</sup>].

## Abstract

The motivation for the thesis arises from the difficulties experienced by business people who are non-programmers with the inflexibilities of conventional packages and tools for model-making. After a review of current business software an argument is made for the need for a new computing paradigm that would offer more support for the way that people actually experience their business activities. The Empirical Modelling (EM) approach is introduced as a broad theoretical and practical paradigm for computing that can be viewed as a far-reaching generalisation of the spreadsheet concept.

The concepts and principles of EM emphasise the experiential processes underlying familiar abstractions and by which we come to identify reliable components in everyday life and, in particular, business activities. The emphasis on experience and on interaction leads to the new claim that EM environments offer a framework for combining propositional, experiential and tacit knowledge in a way that is more accessible and supportive of cognitive processes than conventional computer-based modelling. It is proposed that such environments offer an alternative kind of knowledge representation. Turning to the implementation and development of systems, the difficulties inherent in conventional methods are discussed and then the practical aspects of EM, and its potential for system building, are outlined.

Finally, a more detailed study is made of Decision Support Systems and the ways in which the EM focus on experience, and knowledge through interaction, can contribute to the representation of qualitative aspects of business activities and their use in a more human-centred, but computer-supported, process of decision making. Illustrations of the practical application of EM methods to the requirements of a decision support environment are given by means of extracts from a number of existing EM models.

## Abbreviations

AI – Artificial Intelligence

DEM – Distributed Empirical Modelling

DBMS – Data Base Management Systems

DE – Decision Explorer

DSS – Decision Support Systems

EM – Empirical Modelling

GDSS – Group Decision Support Systems

IS – Information Systems

IT – Information Technology

ISM – Interactive Situation Model

ISMs – Interactive Situation Models

KR – Knowledge Representation

OCI – One-way Closed Interaction

RMM – Restaurant Management Model

SDSS – Strategic Decision Support Systems

SSM – Soft Systems Methodology

SODA – Strategic Option Development and Analysis

TOI – Two-way Open-ended Interaction