

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

ELP
1986.

Massey University Library

Thesis Copyright Form

Title of thesis: Decision Support System: Development And Application
Using Off-The-Shelf Application Packages And
Microcomputers In A Manufacturing Company

- (1) (a) I give permission for my thesis to be made available to readers in the Massey University Library under conditions determined by the Librarian.
- (b) I do not wish my thesis to be made available to readers without my written consent for 24 months.
- (2) (a) I agree that my thesis, or a copy, may be sent to another institution under conditions determined by the Librarian.
- (b) I do not wish my thesis, or a copy, to be sent to another institution without my written consent for 24 months.
- (3) (a) I agree that my thesis may be copied for Library use.
- (b) I do not wish my thesis to be copied for Library use for 24 months.

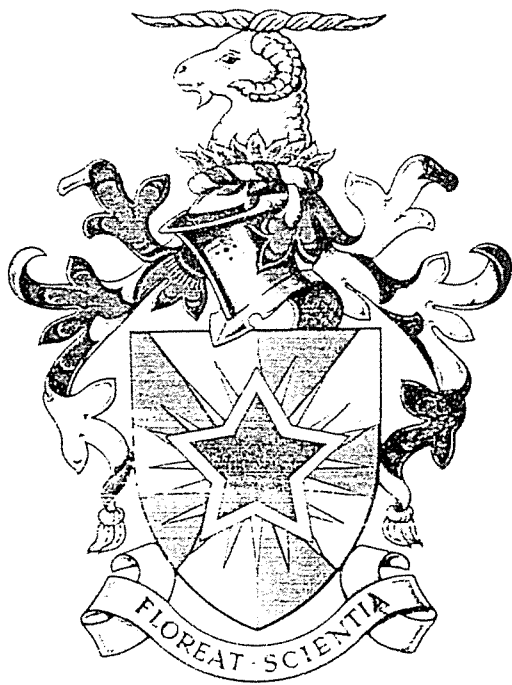
Signed S. W. Tan.

Date S. W. Tan
22/11/86

The copyright of this thesis belongs to the author. Readers must sign their name in the space below to show that they recognise this. They are asked to add their permanent address.

NAME AND ADDRESS

DATE



**DECISION SUPPORT SYSTEM: DEVELOPMENT AND
APPLICATION USING OFF-THE-SHELF APPLICATION
PACKAGES AND MICROCOMPUTER IN A
MANUFACTURING COMPANY**

TAN SIN WEEK

**A thesis presented in fulfilment of the requirements for the
degree of Master of Philosophy in Production and Quality at
Massey University**

November, 1986

ABSTRACT

This research was aim to apply the decision support systems and quality costs concepts to build a Quality Costs Management Information System/Decision Support System (QC MIS/DSS) using off-the-shelf application packages and a microcomputer for the system development. To achieve these aims, a survey was conducted to find out the extent of computer applications in industries in the Manawatu region. Application packages was evaluated to select two suitable packages for the development of a QC MIS/DSS project in Company A.

Survey on the application of computers in the Manawatu region showed that about 47.4% of respondents were using microcomputers. The majority of the respondents used computer programs for finance, invoicing and stock control. Decision support was not yet a major usage.

The Prototype of QC MIS/DSS has the features of easy to use, simple to understand, user controlled, adaptive and easy to communicate with. The mangers/ users were satisfied with the prototype demonstrated. Interest in the possibility of expanding the system to other existing products and for detailed information on quality costs were raised.

Two main factors which contributed to the success of the project were - the prototyping approach used for system development.
- the management support during the system development process.
- the software used.

There were some significant changes after the concept of QC MIS/DSS was introduced to Company A which included improvement on data collection and records for rework, rejects, scraps on the assembly line, increasing the awareness of the quality costs and their significance, as well as the

process efficiency, As a result, work study and time study were carried out on the assembly line.

The project has met the predetermined objectives and the users' requirements. It has also proved that it is feasible to apply the decision support system theories and prototyping system development methodology by using the costs and time saving tools- Application packages for their model building.

To further improve and enhance the effectiveness of the system, it would be very useful to develop the DSS to a semi-expert system which would provide users with warning and some guidelines on what actions to be taken. This could be used as a consultancy device which would further improve the efficiency of the managers and decision makers in decision making.

ACKNOWLEDGEMENTS

My thanks are due especially to Professor J. K. Scott for his support, and my supervisor Mr. E. L. Loo for his steady guidance throughout the project. To Company A for giving me the opportunity to make this research project possible, to the executives and staff of Company A for their help and co-operation, to members of the Altrusa Club for their financial support and to Mrs. M. M. Hilder for her speed and patience in proof-reading this thesis.

Finally, I want to thank my family, friends and staff of the Production Technology Department, Massey University for their encouragement, advise and help during the period of my study.

TABLE OF CONTENTS

	Page
CHAPTER 1. INTRODUCTION.....	1 - 4
CHAPTER 2. DECISIONS AND DECISION MAKING.....	5 - 29
2.1. Introduction.....	5
2.2. Definition Of Decision.....	5 - 6
2.3. Classification Of Decisions.....	6 - 11
2.3.1. Managerial Activities.....	6 - 7
2.3.2. Types of Managerial Decisions.....	8 - 9
2.3.3. Programmed and Non-programmed Decisions....	9 - 10
2.3.4. Structured, Semi-structured and Unstructured Decisions.....	10 - 11
2.4. Approaches Of Decision Making.....	11 - 15
2.4.1. The Rational Manager View.....	12
2.4.2. The "Satisficing" Process-oriented View....	12
2.4.3. The Organizational Procedures View.....	12
2.4.4. The Political View.....	12 - 13
2.4.5. The Individual Differences Perspective....	13
2.4.6. Quantitative And Qualitative Approach.....	13 - 15
2.5. Models Of Decision Making.....	15 - 21
2.5.1. Normative Model.....	15
2.5.2. Descriptive Model.....	15
2.5.3. Quantitative Model.....	16
2.5.4. Decision - Centred Model.....	16 - 21
2.6. Techniques For Making Decisions.....	21 - 26
2.6.1. Traditional Techniques For Programmed Decisions.....	22
2.6.2. Modern Techniques For Programmed Decisions.....	22 - 26
2.7. Conclusion.....	26 - 29

	Page	
CHAPTER 3. DECISION SUPPORT SYSTEMS (DSS).....	30	- 53
3.1. Introduction.....	30	
3.2. Current Research And Opinions.....	30	- 32
3.3. Definition Of Decision Support Systems.....	33	
3.4. Decision Making, Information And Managerial Judgement Within A DSS Environment.....	34	- 35
3.5. Framework Of Decision Support Systems.....	35	- 37
3.6. Relationships Of Decision Making And Development Of Decision Support Systems.....	37	- 39
3.6.1. The Rational Manager View.....	37	
3.6.2. The "Satisficing" Process-oriented View....	38	
3.6.3. The Organizational Procedures View.....	38	
3.6.4. The Political View.....	38	
3.6.5. The Individual Different Perspective.....	39	
3.7. Decision Support System Development Methodology...	39	- 45
3.7.1. Conventional Design Approach.....	40	- 41
3.7.2. Prototyping Approach.....	41	- 43
3.7.3. User- developed Systems Approach.....	43	- 44
3.7.4. Factors For Determining The Development Approach.....	44	- 45
3.8. The Design Of Decision Support Systems.....	45	- 49
3.8.1. The Components Of Decision Support Systems.....	45	- 48
3.8.2. The Success Factors For Design Of Decision Support Systems.....	48	- 49
3.9. Conclusion And Further Development.....	49	- 50

	Page	
CHAPTER 4. SURVEY ON COMPUTER APPLICATION IN MANAWATU REGION.....	54	- 83
4.1. Introduction.....	54	- 55
4.2. The Objectives Of The Survey.....	55	
4.3. Methodology.....	55	- 57
4.3.1. The Population.....	55	
4.3.2. The Sample.....	56	
4.3.3. Survey Procedure.....	56	- 57
4.4. Questionnaire Design.....	57	
4.5. The Results Of The Survey.....	58	- 81
4.5.1. Respondent Characteristics.....	58	
4.5.2. Survey Bias.....	58	
4.5.3. Interpretation Of Tables.....	59	- 60
4.5.4. The Results.....	60	- 81
4.6. Conclusions.....	81	- 83
 CHAPTER 5. MICROCOMPUTER APPLICATION PACKAGES' PERFORMANCE		
EVALUATION : SOME GUIDELINES FOR THE MANAGER.....	84	- 104
5.1. Introduction.....	84	
5.2. Types of Application Package.....	84	- 85
5.3. Performance Evaluation Criteria	85	- 88
5.3.1. Basic requirements of the package for the Quality Costs MIS/DSS.....	86	
5.3.2. Software evaluation criteria.....	86	- 88
5.4. Evaluation of Application Software.....	89	- 103
5.4.1. Brief introduction of the package selected for evaluation.....	90	- 91
5.4.2. Methodology for evaluation of packages.....	91	- 101
5.4.3. Evaluation results.....	102	- 103
5.5. Conclusion.....	103	- 104

	Page
CHAPTER 6. DEVELOPMENT OF QUALITY COSTS MANAGEMENT INFORMATION SYSTEM /DECISION SUPPORT SYSTEM (QC MIS/DSS) IN A MANUFACTURING COMPANY.....	105 - 149
6.1. Introduction.....	105 - 106
6.2. The Objective Of The Project - Development Of A QC MIS/ DSS For Product P.....	106 - 107
6.3. Problems And Difficulties Encountered During System Development Process.....	108 - 109
6.4. Concept Of Quality Costs.....	110
6.4.1. Quality Costs Category.....	110 - 111
6.4.2. Model For Optimum Quality Costs.....	111 - 112
6.4.3. Analysis Techniques Of Quality Costs.....	112 - 114
6.5. Developing The QC MIS/DSS.....	114
6.5.1. The Benefits Of Using Quality Costs MIS/DSS.....	115
6.5.2. The System Development Process Of The QC MIS/ DSS.....	115 - 130
6.6. The System Output.....	131 - 144
6.7. Future Development.....	145 - 146
6.8. Conclusions.....	146 - 149
CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS.....	150 - 155
7.1 Reviewing The Survey Finding.....	150 - 151
7.2. Review On development of Quality Costs MIS/ DSS Project.....	151 - 152
7.3. The Benefits And Success Factors Of The Project...	153 - 154
7.4. The Effects Of The Project.....	154 - 155

	Page
APPENDIX -A. SURVEY QUESTIONNAIRES AND INFORMATION ON COMPUTER, AND PROGRAMS.....	156 - 173
APPENDIX -B. COMPARISON OF INTEGRATED APPLICATION PACKAGES.....	174 - 183
APPENDIX -C. DATA NEEDED FOR QUALITY COSTS MIS/DSS.....	184 - 188
APPENDIX -D. QUALITY COSTS DATA BASE MIS SCREENS.....	189 - 199
APPENDIX -E. QUALITY COSTS MIS/DSS PROTOTYPE SUMMARY.....	200 - 201
BIBLIOGRAPHY.....	202 - 233

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

This research project is associated with the increasing use of microcomputers in industry. This increasing popularity could be linked to the more competitive business environment, rapidly changing and advancing technology, the development of cheaper, high speed, low cost and larger capacity microcomputers with easier to use application programs.

The purpose of this research is to:-

1. Survey the application of computers in the manufacturing industry in the Manawatu region.
2. Evaluate certain application packages- data base management packages for data base and integrated packages for modelling purposes.
3. Investigate the methodologies used in developing Decision Support Systems by developing as an example, a management tool - Decision Support System to support managerial decision making for strategic planning (using a microcomputer and off-the-shelf application packages - dBASE III and Lotus Symphony). This will also give experience in the development of a decision support system along with the concept and methodology established by the researchers.

From the study of the available literature and case studies of Decision Support Systems it showed that there was a gap in the use of technical tools in building DSS. Mainframe or minicomputers and programming language (e.g. BASIC, COBOL) were mainly being used. This research study is an attempt to use an easily available application package and a fourth generation package which run on an IBM PC to build a Quality Costs Management Information System/ Decision Support System. The system could be used to assist and support managers in their strategic planning in quality assurance and indirectly in marketing, production, and purchasing.

This research was initiated firstly because of the popularity of microcomputers and the vast variety of application packages on the market which are lower in costs than mainframe packages, easy to use and will enable a non-computer specialist to build his own models within a short period of time. A second factor was the increasing awareness of the usefulness and benefits of quality costs control.

There were many models for decision support systems in the academic literature. They were mainly complex models built by using computer programming languages - eg. COBOL, FORTRAN, BASIC and other programming languages. These decision support systems were costly to build and need a long time span for system development by information system(IS) specialists. The effectiveness of the data processing function has been significantly hampered by a variety of problems, e.g. behind schedule, system maintenance requirements that absorb a large proportion of staff resources; and computer application which failed to meet the user's requirements [1].

Recently, it has been suggested that applications development by users themselves can provide solutions to both problems, firstly by relieving the IS professionals of some of their workload; and secondly by alleviating some of the DP user communication problems [3].

The growth in the use of microcomputers in the United States between 1983- 1984 was around 150 per cent [4]. The study carried out on the use of microcomputers in New Zealand over the first six months of 1985 suggested that approximately 70 per cent of managers of large companies in New Zealand will be using microcomputers by 1987 [2].

A very recent survey done by Arthur Hoby Associates on the New Zealand Computer Market [3] showed that personal computers have increased their penetration substantially with a total of 77.2 per cent of the user community running personal computers internally, compared to 47.9 per cent

in 1985 in New Zealand. The study also showed that application packages are considerably more popular than application programs developed inhouse. Moreover, fourth generation language software tools, e.g. dBASE II, dBASE III are becoming increasingly popular - accounting for 17.6 per cent of all application development done. (Up 91% from 1985)

This research was carried out by :

1. Reviewing the literature on the nature of decisions and the decision making process.
2. Reviewing literature on Decision Support Systems(DSS) and the methodologies of building decision support systems.
3. Surveying the extent of computerization in industry in the Manawatu region.
4. Studying and comparing the functions and capabilities of certain popular application packages on the market.
5. Reviewing the literature on Quality Costs.
6. Identifying the needs of users in a local manufacturing company which we shall call Company A.
7. Based on 6 above, building a Quality Costs MIS/ DSS by using a fourth generation package - dBASE III and an integrated package - Lotus Symphony for Company A.
8. Evaluating and drawing conclusions from the above.

Heavy emphasis has been put on current thinking about decision making process theories and decision support system building methodologies in the project development process. The first three chapters of the report discuss decisions, the decision making theories and decision support systems. Chapter 4 ,analyses the results of the survey. Chapter 5 studies and compares certain application packages on the market and selected two suitable packages for project development. Chapter 6 describes the decision support system project at Company A. ie. model building process, problems and difficulties encountered. The last chapter is the conclusion and summary of the research.

References

- [1] Arthur Hoby Associates Annual Hoby Survey of New Zealand computer industry. Arthur Hoby Associates, 1986.
- [2] Hodgkinson, S. and Bond, D. "Managerial use of microcomputers in NZ". Interface, May, 1986, p16-18.
- [3] McLean, E. L. "End users as application developers". MIS Quarterly, 3, 3, Dec, 1979, p37-46.
- [4] Verity, J. W. "Up, up and away". Datamation, May 15, 1985, p32- 42.