

**TOWARD A THEORY OF INFORMATION CHOICES
IN ORGANISATIONS:
AN INTEGRATIVE APPROACH**

Raymond Morissette

**A thesis
presented to the University of Waterloo
in fulfilment of the
thesis requirement for the degree of
Doctor in Philosophy
in
Accounting**

Waterloo, Ontario, Canada, 1996

© Raymond Morissette 1996



National Library
of Canada

Acquisitions and
Bibliographic Services

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque nationale
du Canada

Acquisitions et
services bibliographiques

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced with the author's permission.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-21371-4

The University of Waterloo requires the signatures of all persons using or photocopying this thesis. Please sign below, and give address and date.

ABSTRACT

TOWARD A THEORY OF INFORMATION CHOICES IN ORGANISATIONS:

AN INTEGRATIVE APPROACH

This thesis develops an integrative model of the factors that may influence the choices of quantitative financial and quantitative non-financial performance indicators managers use for monitoring purposes in organisations. Financial information expressed in the monetary metric has traditionally been seen as the principal ingredient of the managers' information menu for performance monitoring purposes. In contrast, stories and anecdotes in the business and investor communities suggest that managers also rely heavily on a handful of critical performance indicators expressed in non-monetary metrics, such as the rate of raw materials overuse or the number of products returned by customers, for monitoring purposes. In an attempt to understand the factors influencing managers' information choices, this thesis draws from the management, judgement and decision-making, management accounting, and organisational literatures to identify potential factors that could help in explaining the managers' mix of financial and non-financial information.

The thesis begins with theory-building involving the development of a preliminary model and research propositions. A field study was then conducted in six firms of different sizes and from different industries in the manufacturing and service sectors. During the field work, data were gathered through direct observations, archival data, and a questionnaire and interview of 42 managers working in the production-operation, marketing-sales, and human resources areas. Using an individual level of analysis, the data revealed patterns of information use and allowed for the identification of seven potential factors or determinants of the managers' choice of performance indicators.

The field results suggest that managers from all levels of decision making who work in throughput (output) functions, such as production-operation and human resources (marketing-sales) involving different levels of perceived external environmental uncertainty, tend to use a mix of information that includes a greater proportion of non-financial (financial) information than financial (non-financial) information. Along with the managers' level of experience and perceptions of their work as routine or nonroutine, the nature of the performance indicators they perceive their superiors use to reward their performance, including the managers' focus on a limited number of critical cause-effect relationships between non-financial and financial performance indicators, all tend to influence the proportion of non-financial and financial information they use for monitoring purposes. As a result, the theoretical model and the ten analytical generalisations developed in this thesis call for future model testing.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. Anthony A. Atkinson for his guidance and never-ending support throughout the dissertation process and during my doctoral programme. As well, I am indebted to Dr. Efrim Boritz, Dr. John Waterhouse, and Dr. Jane Webster, my dissertation committee members, who provided helpful comments and suggestions. I would also like to thank Dr. John H. (Harry) Evans III who kindly consented to be the external reader of my thesis.

A number of individuals and organisations helped in the collection of the data used in this thesis. They include six anonymous organisations located in the Province of Québec that allowed 42 of their managers to take part in this research and generously gave their time for this study. I would like to specially thank the firms Samson Bélair/Deloitte & Touche and KPMG and their representatives, Clarence Turgeon, Brigitte Vachon, Richard Simard, France Alain, Jean Blouin, and Bertrand Lachance for their precious help in providing some of the organisation contacts for the organisations targeted in this study.

This thesis would not have been possible without the encouragement and support of my family and close friends, especially Dr. Theresa Libby, Dr. Paul-É. André, Dr. Johnny Jermias, Dr. Claude Pilote, Yvan Bourassa, Carole Bolduc, Hélène Racine, Pierre-Yves Desbiens, Lorraine Gilbert, Annie Larochelle, Pierre Beaudoin, Sylvie Cloutier, André Huot, Nicole Tremblay, Pascal Rochefort, Gilles Fortin, Marie Lessard, Denis Gosselin, Ginette Lachance, Jacquelin Perreault, Marie Paré, Pascal Gagné, Jean-Pierre Cyr, Guy Émond, Denis Gélinas, Daniel St-Georges, François Harvey, Johanne Lemieux, and Nicolas Royer. Also, special thanks to Jacques Fortin, my director at L'École des Hautes Études Commerciales (H.E.C) at Université of Montréal, and to Dr. Paul-Victor Paré, my former director at L'Université Laval, for their never-ending support during my studies.

I will remain truly indebted to Joseph-André Giroux, Yvan Gingras, Jean-Pierre Grenon, Michel Drolet, and Pierre Laberge for the confidence they placed in me and the training I received while working with them in the earlier stages of my career as a professional in the business world. Most of all, they taught me how important it is to analyse problems from a broader perspective where decision-timing issues may be prevalent and accounting or financial implications may often represent a smaller piece of the whole puzzle to be solved.

A special note of gratitude is extended to my fellow Ph.D. students Susan McCracken, Steve Fortin, Shane Dikolli, Kathryn Bewley, Jeffrey Pittman, Marie-Josée Ledoux, Norman Wise, and everyone at the School of Accountancy who provided invaluable assistance and advice, both tangible and intangible. A special thanks to Dr. Kathryn Kadous, Dr. Phelim Boyle, Dr. Leonard Eckel, and Dr. Howard Armitage for their never-ending encouragement and precious comments. Finally, I would like to thank L'École des Hautes Études Commerciales de Montréal, L'Université Laval, and the Institute of Certified Management Accountant of Canada (CMA) for their financial support and assistance during my doctoral programme.

To Jeanne d'Arc and Richard,
my godmother Ida,
Yvon, Lorraine, and Renald,
my aunts Bernadette and Suzanne,
and
to my family

TABLE OF CONTENTS

ABSTRACT.....	iv
ACKNOWLEDGEMENTS.....	v
LIST OF TABLES.....	xi
LIST OF ILLUSTRATIONS.....	xii
CHAPTER 1. INTRODUCTION AND OVERVIEW.....	1
1.1 Introduction.....	1
1.2 The Method.....	7
1.3 Overview of the Thesis.....	8
CHAPTER 2. LITERATURE REVIEW AND THEORY BUILDING.....	9
2.1 Introduction: A brief Overview of the Integrative Model.....	9
2.2 The Dependent variable: the Mix of Quantitative Financial and Quantitative Non-financial Information.....	12
2.2.1 Definitions.....	12
2.2.2 Important characteristics of financial and non-financial information.....	14
2.3 The Independent variables.....	21
2.3.1 The contextual variable: managers' perceived external environmental uncertainty.....	21
2.3.2 Organisational variable: the types of decisions.....	30
2.3.3 Organisational variable: the nature of the task-technology.....	39
2.3.4 Organisational variable: managers' perceptions of the reward systems.....	47
2.3.5 Organisational variable: the organisation's strategy.....	53
2.3.6 Manager's perceived causal relationships among performance measures.....	62
2.4 Summary.....	73

CHAPTER 3. RESEARCH METHODOLOGY AND DESCRIPTIVE STATISTICS.....	77
3.1 Introduction.....	77
3.2 Research Methodology.....	77
3.3 Sampling Strategy.....	80
3.3.1 Firm selection.....	80
3.3.2 Data collection process.....	83
3.4 Description of the Sample.....	86
3.5 Quantitative Data Collected.....	92
3.5.1 The mix of quantitative information managers use.....	93
3.5.2 The perceived external environmental uncertainty (PEU).....	97
3.5.3 The level of organisational centralisation (Central).....	98
3.5.4 The nature of the task-technology (Task).....	99
3.5.5 The nature of the reward systems (Perform).....	100
3.5.6 The organisation's strategy (Organ).....	101
3.5.7 The manager's perceived causal relationships (Causal).....	102
3.5.8 Managers' characteristics.....	105
3.6 Conclusion.....	107
CHAPTER 4. FIELD RESULTS AND DISCUSSION.....	111
4.1 Introduction.....	111
4.2 Preliminary Quantitative Evidence: the Regression Model.....	113
4.2.1 The regression model.....	114
4.2.2 Robustness analyses.....	124
4.2.3 Conclusion.....	128
4.3 Further Field Study Results.....	128
4.3.1 Managers' functional area and their mix of information.....	128
4.3.2 Examination of Propositions P1, P2, P3: managers' perceived external environmental uncertainty.....	142
4.3.3 Examination of Propositions P4, P5, P6: the types of decisions.....	156
4.3.4 Examination of Proposition P7: the nature of the task-technology.....	170
4.3.5 Examination of Proposition P8: manager's perceptions of the reward systems.....	179
4.3.6 Examination of Proposition P9: the organisation's strategy....	191
4.3.7 Examination of Proposition P10, P11, P12: managers' perceived causal relationships among performance measures..	200
4.4 Summary of the Field Results.....	219

CHAPTER 5. MODEL REVISION AND CONCLUSION.....	225
5.1 Introduction.....	225
5.2 Model Revision.....	225
5.2.1 Summary.....	233
5.3 Contribution of this Thesis.....	234
5.4 Limitations of this study.....	237
5.5 Directions for Future Research.....	239
APPENDIX A. QUESTIONNAIRE.....	241
APPENDIX B. MANAGER’S FUNCTIONAL MENTAL MODEL.....	275
APPENDIX C. FIELD INTERVIEW GUIDE.....	283
REFERENCES.....	307

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Perceived external environmental uncertainty.....	24
2. Types of decisions.....	32
3. Perrow's task-technology.....	41
4. Organisational strategy.....	56
5. Firms' classification and summary of interviews conducted at six sites.....	88
6. Interview breakdown.....	91
7. Summary of correlation and reliability coefficients.....	104
8. Demographic statistics.....	106
9. Managers' mix of information.....	121
10. Managers' perceived external environmental uncertainty, functional areas, and decision levels.....	145
11. Managers' perceived external environmental uncertainty, perceptions of organisational centralisation, and organisational size.....	149
12. Managers' perceptions of task-technology.....	170
13. Managers' perceptions of performance-reward indicators and decision levels...	181
14. Managers' perceptions of performance-reward indicators and functional areas.....	186
15. Managers' experience backgrounds and skills.....	193
16. Managers' perceptions of causal relationships and functional areas.....	208
17. Analysis of covariance of the total number of causal relationships between non-financial and financial indicators.....	210
18. The nature of parallel information source and the manager's functional area.....	215
19. The nature of parallel information source and the manager's hierarchical position.....	216
20. Summary of the propositions' support.....	220

LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Page</u>
1. Determinants of the mix of quantitative information managers use in organisations.....	10, 112
2. The Nanni et al. [1990] results.....	34
3. Perceived causal relationships.....	64
4. Managers' mix of information.....	130
5. Managers' perceived external environmental uncertainty.....	143
6. Managers' mix of information.....	157
7. Compared views of managers' mix of information.....	169
8. Managers' complexity of causal relationships.....	205
9. Managers' perceptions of causal relationships between financial and non-financial performance indicators.....	207
10. Revised model: Determinants of the mix of quantitative information.....	226

CHAPTER 1

INTRODUCTION AND OVERVIEW

1.1 INTRODUCTION

The traditional role or mission of accounting in organisations has been to provide managers with numerical information expressed mainly in terms of financial or monetary values for monitoring and decision-making purposes [Kida and Smith, 1995; Cooper and Kaplan, 1991].¹ Most of the management accounting literature has focused on the role of aggregated financial information in organisations. However recently, interest has emerged in the use of non-financial information in performance measurement [Atkinson et al., 1996; MacArthur, 1996; Coates et al., 1995; Ittner et al., 1995; Fornell et al., 1996; Manzoni, 1994; Bruns and McKinnon, 1993; Fisher, 1992; Armitage and Atkinson, 1990; Simons, 1990; Nanni et al. 1990; Cooper and Kaplan, 1991; Johnson and Kaplan, 1987].

Financial analysts and institutional investors communities are expressing a growing interest in the use of non-financial information [Birchard, 1994]. Fornell et al. [1996] investigated the effects of the public release of non-financial indices of customer satisfaction on the firm's stock market returns. Their results suggest that the disclosure of

¹ Quantitative financial information represents a piece of information expressed in the monetary metric, resulting from the measurement of past, present and future economic events, or has a financial character. Alternatively, quantitative non-financial information represents any other quantitative measures expressed in a metric other than monetary.

non-financial customer satisfaction measures provides new and forward-looking information to the stock market that is not completely reflected by traditional accounting performance measures such as profit. This growing interest for public disclosure and use of non-financial indicators by the investors community also suggests that this information may be available and used in the organisation for monitoring purposes.

Even though much of the quantitative financial information represents an aggregated measure of the results of managing the processes that create the financial results, managers may prefer direct measures of process performance rather than the summary results conveyed by the financial numbers [Lebas, 1995, Johnson and Kaplan, 1987]. The use of direct and specific measures that are tied to the organisation's processes allows managers to promptly react to unsatisfactory outcomes by taking immediate steps to intervene in the processes to achieve the desired financial results. Using an analogy, Lebas [1995] considers the organisation's financial results as the fruit on the tree representing the culmination of all the activities or processes required to produce the fruit.

Lebas also suggests that managers should focus on the measures of the activities producing the fruit in order to assure that the tree will bear such a desired fruit. However, before proposing such an important shift in the manager's focus from financial to non-financial information, more in-depth studies should be conducted to investigate the circumstances or phenomena and individual characteristics that may influence managers to use financial and/or non-financial information for monitoring purposes.

This study is an attempt to provide a better understanding of those factors that may influence the manager's information choices. Adopting a contingency approach, this study proposes an integrative model that captures the potential effects of contextual, organisational, and individual variables on the mix of quantitative financial and quantitative non-financial information managers use in manufacturing and service organisations.

A review of the management accounting literature shows that only a few field studies, some surveys, and archival studies have attempted to investigate the nature of the quantitative information managers use [Atkinson et al., 1996; MacArthur, 1996; Abernethy and Lillis, 1995; Coates et al., 1995; Ittner et al., 1995; Lebas, 1995; Manzoni, 1994; Curtis, 1994; Gul and Chia, 1994; Bruns and McKinnon, 1993; Fisher, 1992; Armitage and Atkinson, 1990; Nanni et al., 1990; Simons, 1990, 1987; Kaplan, 1984]. Although these studies shed some light on the information managers use, they do not include individual characteristics of managers as explanatory variables nor do they develop an integrative model to explain the factors that influence the composition of the mix of quantitative information managers use in organisations.

Recent field-work reports suggest that, when managers are asked about useful data, they mention quantitative non-financial data that relates to "daily control of operations and physical output (....) However, when asked to name their most useful report, they cite a monthly income or expenses report" [Bruns and McKinnon, 1993, p.101]. The absence of a model in the management accounting literature that integrates the determinants of the mix of quantitative information managers use makes it difficult to understand this inconsistency in the managers' responses. The model proposed in this

thesis attempts to fill this research gap and to answer Fisher's [1992] call for the development of integrative models that could provide a better understanding of the use of financial and non-financial information in organisations.

The mix of quantitative information a manager uses is assumed to reflect his information preferences and the information he is mandated by his superior or required by his functional position to use for monitoring purposes.² Identifying the conditions under which quantitative financial and quantitative non-financial information is used may help in the design of information systems that better correspond to the manager's revealed preferences for quantitative information. For example, production managers may rely heavily on a restricted number of quantitative non-financial measures gathered through ad hoc information systems, including ad hoc costing systems, because they are not provided with the information they require to monitor and make decisions on the organisation's processes [Clancy and Collins, 1979].

In addition, management information systems, which have been criticised for providing managers with too much information obtained too late (not on a daily or weekly basis), often too aggregated or of an irrelevant nature, should be refocussed toward the managers' "true" information need, that is "How the organisation really operates" [Gosse, 1993; Simons, 1990; Johnson and Kaplan, 1987]. Providing managers with relevant and direct non-financial information on the performance of organisational processes on a timely basis makes them able to intervene in the process to achieve the desired financial results [MacArthur, 1996; Bruns and McKinnon, 1993; Nanni et al., 1990].

² In this thesis, the masculine form is used throughout to signify both feminine and masculine with no discriminatory intent.

Consequently, a better understanding of the factors that determine the nature of quantitative information used in organisations may help managers to make better investment decisions in management information systems such as budgeting, operations systems, and compensation systems.

This thesis also provides a bridge between prior research in management accounting that focuses on financial budgeting issues and the evidence that managers seem to attribute a great deal of importance to the factors that drive the results in financial budgets. Non-financial information, for example, the number of units produced, the number and percentage of deviations from the preventative maintenance programme, or quantity of energy required may represent a significant proportion of the mix of information managers use [Manzoni, 1994; Bruns and McKinnon, 1993; Fisher, 1992; Armitage and Atkinson, 1990; Nanni et al., 1990]. Operational and plant managers may put more weight on understanding and monitoring the underlying drivers in financial budgets than on the budgets themselves. Consequently, financial budgeting research may provide only a very rough and possibly misleading portrait of the quantitative information managers use in organisations. In short, managers may use much more than the financial information in budgets for monitoring purposes. Therefore, investigating the determinants of the mix of quantitative information managers use could improve the relevance of budgeting issues by adding an important segment of quantitative non-financial information that is absent from the budgeting literature.

The definition of the terms “financial” and “non-financial” information used in prior studies is often ambiguous or totally absent [Abernethy and Lillis, 1995; Bruns and

McKinnon, 1993; Nanni et al., 1990). Although Manzoni [1994] uses refined measures of financial and non-financial performance measures, the classification instruments used in those studies rely mainly on the managers' common understanding of what is financial information and anything else expressed in other metrics than dollars is considered to be non-financial information. An additional contribution of this thesis will be to provide a clear definition of quantitative non-financial information and the instruments required to classify and capture the richness of the mix of quantitative financial and quantitative non-financial information managers use in organisations.

The development of a general model of the determinants of the mix of quantitative information managers use in organisations may also help students understand the complexity of the quantitative information environment in organisations. This new trend that fosters the development of frameworks to understand organisational phenomena, to which Kaplan [1994] and Otley [1994] refer, could be seen as a response to the call to bring some of the richness of organisations into the classroom and to teach students not only techniques, but also to provide them with theories and models that foster students' thinking so that "they can take a fresh perspective on the very things they know well" [Mintzberg, 1989, p.91]. The model proposed in this thesis could help students to better understand the relationships among the determinants of the mix of quantitative information managers use in organisations.

1.2 THE METHOD

This study is “analytical” research that draws inferences and makes extensions from prior research to develop a series of 12 preliminary theoretical propositions [Yin, 1994; Atkinson, 1990]. As part of this model-building mode, this study relies on observations gathered through exploratory field studies including direct observations, archival data gathering such as firms’ internal reports, press clippings, and the administration of a questionnaire and an interview to a total of 42 managers working in the production-operation, marketing-sales, and human resources areas in six organisations from diverse sectors of activities, all located in the Province of Québec.³ The results of the qualitative analyses supplemented by quantitative analyses of the data collected through a questionnaire and an interview support the model revision effort of this thesis and the development of a set of theoretical generalisations (also called “analytical generalisations”). In short, theoretical generalisations represent the extensions of repetitive patterns of evidence, that provide support for a set of theoretical propositions, into a theory attempting to explain a phenomenon [Yin, 1994]. Since the primary focus of this thesis is model building and not large-scale model testing, no statistical generalisations are made in this research.

³ Throughout this thesis, the references made to the field study evidence implies a combination of the information collected from either sources such as direct observations, archival data, questionnaires, or interviews.

1.3 OVERVIEW OF THE THESIS

The remainder of this thesis is organised as follows. Chapter 2 includes a review of the relevant management, cognition, judgement and decision-making, and management accounting literatures on the variables that are believed to influence the mix of quantitative information managers use in organisations. Based on the literature review, a set of theoretical propositions and their rationales are developed and organised into an integrative model that is used to direct the field study inquiry. Chapter 3 describes the exploratory research method and the instruments used to capture each of the variables included in the preliminary model. Chapter 4 provides qualitative field study evidence supplemented by quantitative analyses to revise the theoretical model and propositions developed in Chapter 2. Based on the field study results, Chapter 5 presents the revision of the theoretical model and the development of the theoretical generalisations. Chapter 5 also highlights the contribution this research makes to the understanding of the factors that influence the managers' mix of information and provides directions for future research.

CHAPTER 2

LITERATURE REVIEW AND THEORY BUILDING

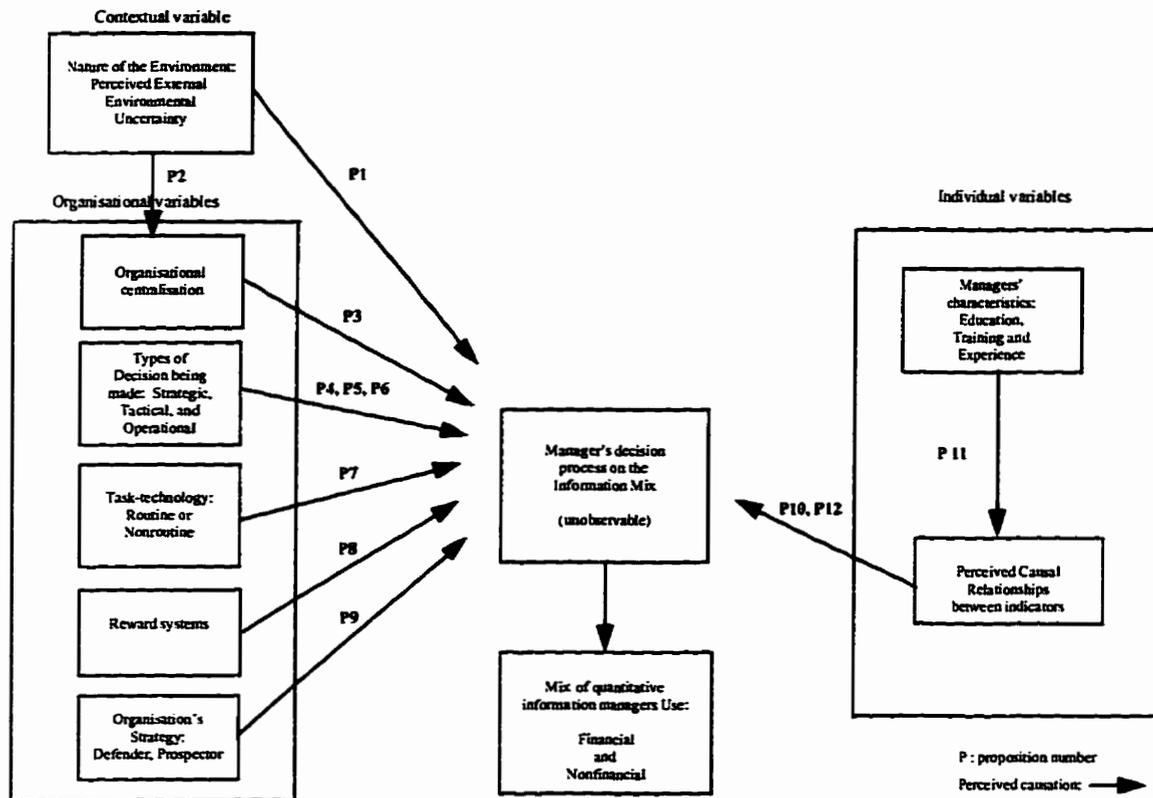
2.1 INTRODUCTION: A BRIEF OVERVIEW OF THE INTEGRATIVE MODEL

A review of the relevant literatures in management accounting, judgement and decision-making, and management has revealed important variables that may influence the mix of information managers use in organisations. In Figure 1, the variables identified from this literature review are organised in a model based on a contingency approach that includes “contextual”, “structural or organisational”, and “individual” variables to investigate their possible effects on the manager’s choice of his mix of quantitative information.⁴

⁴ The “contextual” and “structural or organisational” groupings are drawn for the management literature terminology and used in this study to differentiate the variables included in these categories from the individual characteristic variables per se, even though the former are mainly assessed through perceptual measures.

Figure 1

**Determinants of the Mix of Quantitative Information Managers use
in Organisations**



Research in management and management accounting suggests that the manager's perceived level of external environmental uncertainty, a contextual variable, influences the nature of the information used in organisations [Mangaliso, 1995; Gul and Chia, 1994; Chenhall and Morris, 1986; Gordon and Narayanan, 1984]. Structural variables such as the reward systems and the organisation's strategy, the nature of the task-technology managers accomplish, the level of organisational centralisation, and the types of decisions managers make are considered in the management, judgement and decision-making, management accounting literatures to affect the managers' use of information [Ittner et al., 1995; Coates et al., 1995; Simons, 1990; Miles and Snow, 1978; Bonner, 1990; Perrow,

1967; MacIntosh, 1981; Schwenk, 1995; Anthony, 1965]. The cognition, judgement and decision-making, management, and management accounting literatures along with measurement theory suggest that individuals' characteristics such as their ability or degree of experience in perceiving causal relationships between performance indicators could influence the managers' use of information [Matlin, 1989; Calori et al. 1994; Fiol and Huff, 1992; Lebas, 1995; Bruns and McKinnon, 1993].

The manager's decision process, which is unobservable, is not the direct focus of this thesis. Since it is impossible to directly observe the managers' decision process in the context of field study work, the analysis focuses on the results of the decision process (or the revealed information choices), namely the quantitative information mix that managers actually use.⁵ The variables that form the integrative model proposed in this thesis are believed to influence the composition of the mix of quantitative information used, which represents the observable outcome of the manager's revealed information preferences for monitoring purposes.

The remainder of this chapter is organised as follows. Section 2.2 provides the definitions of financial and non-financial information used in this dissertation. It also highlights the important characteristics of financial and non-financial information of interest in this study. Section 2.3 includes a literature review and the research propositions that relate to each of the contextual, organisational, and individual variables included in the theoretical model. This chapter closes with a summary in Section 2.4.

⁵ Since the managers' decision process is not directly observable and as this study attempts to develop a theory of information choices in organisations, it would be hazardous to investigate in a setting other than in a controlled environment (e.g. a laboratory experiment) the individuals' decision process. For these reasons, the analysis focuses on the results of the managers' decision process, that is, the mix of information they use.

2.2 THE DEPENDENT VARIABLE: THE MIX OF QUANTITATIVE FINANCIAL AND QUANTITATIVE NON-FINANCIAL INFORMATION

2.2.1 Definitions

The management accounting literature is characterised by the absence of a clear distinction between the terms financial and non-financial information [MacArthur, 1996; Gul and Chia, 1994; Manzoni, 1994; Bruns and McKinnon, 1993; Chenhall and Morris, 1986; Clancy and Collins, 1979; Gordon and Miller, 1976]. Although ambiguous without the use of a clear definition, the distinction between financial and non-financial information is often left to the common understanding that individuals have of those terms.⁶ When people refer to financial information, they normally mean quantitative financial information due to the importance of financial or monetary issues in the individuals' life.⁷

Financial information is generally associated with the information contained in the financial statements. According to the American Accounting Association [1975], financial information is a quantitative measure, expressed in the monetary metric, resulting from the measurement of past, present and future economic events, or has a financial character. According to this definition, 1) a piece of information expressed as a monetary unit, 2) ratios resulting from mathematical manipulations of information expressed in monetary units, and 3) a piece of information resulting from a ratio that includes a piece of information expressed in a monetary unit and a non-monetary unit can be classified as

⁶ Anecdotal field evidence suggests that managers who are asked to identify non-financial information often confound qualitative information, i.e. information that is not expressed in terms of numerical metric, with non-financial numerical expressions.

⁷ According to the Collins English dictionary, third edition, quantitative information refers to the aspect or property of an entity having a magnitude that can be measured, weighed and counted according to a metrical system and expressed in terms of a unit of measure. From the Latin "quantitas" which means amount.

financial information. Therefore, there are three types of quantitative financial information:

$$1) \text{ Monetary Metric, } \quad 2) \text{ Ratio} = \frac{\text{Monetary Metric}}{\text{Monetary Metric}}, \quad 3) \text{ Ratio} = \frac{\text{Monetary Metric}}{\text{Non - Monetary Metric}}$$

Based on this definition, the amount of sales, profit, stock price, cash-flows generated by operations, variance analysis, return on investment (ROI), return on equity (ROE), cost per unit produced and other information expressed in the monetary metric coming from the financial statements or from financial accounting systems can be classified as quantitative financial information. The rate of interest is a piece of information with a financial character and is therefore considered to be quantitative financial information. The cost per unit represents an economic or valuation phenomenon, therefore it is financial.⁸

The accounting literature defines quantitative non-financial information by default, i.e. the measures not meeting the requirements of financial information [Manzoni, 1994; Bruns and McKinnon, 1993]. The corollary for the definition of non-financial information includes any quantitative measure, 1) expressed in a metric other than a monetary unit, or 2) that results from mathematical manipulations or ratios of pieces of information expressed in metrics other than monetary units. The expressions that are captured by this definition can be represented respectively as follows:

$$1) \text{ Non - Monetary Metric, } \quad 2) \text{ Ratio} = \frac{\text{Non - Monetary Metric}}{\text{Non - Monetary Metric}}$$

⁸ The classification of the market share indicator may cause problems. Considering that market share may be of financial character and may be obtained from a mathematical transformation, i.e. organisation total sales divided by total market sales, it is therefore often classified as quantitative financial information.

According to this definition, indicators such as time of delivery in hours or days, yields (e.g. the number of tons of newsprint produced by shift to the number of tons of woodchips used), the level of waste produced by a process, the defect rate of a production process, the number of employees, the number of competitors and employee absenteeism are examples of quantitative non-financial information.⁹ These two definitions and their respective groups of expressions are believed to provide clear classification tools that can help to avoid any future misunderstanding about the meaning of either category of quantitative information. In addition, these classification tools could be helpful in providing a consistent categorisation of information for future research in the accounting and related management disciplines.

2.2.2 Important characteristics of financial and non-financial information

For the last ten years, a new current of research has emerged in management accounting motivated by managers' disappointment with the use of traditional and aggregated financial performance measures provided by the accounting function. Fuelling the debate on the use of alternative or complementary measures to financial performance indicators, Johnson and Kaplan [1987] raise the issue that managers focus too much on financial measures that are too late, too aggregated, and too distorted rather than on quantitative non-financial measures. Along with other researchers, Johnson and Kaplan suggest that non-financial indicators could be more informative and useful in helping

⁹ The yield measure, which constitutes an important measure of productivity, refers to the ratio of output per unit of resource expended, i.e. inputs, and expressed in the same physical terms or commodity. The output unit can take diverse forms such as footage, machine or man hours, tonnage, time length, etc. [The 1975 American Accounting Association Report of the Committee on Non-financial Measures of Effectiveness]

managers to understand the organisation's operational context and to manage the firm's processes [MacArthur, 1996; Bruns and McKinnon, 1993; Fisher, 1992; Armitage and Atkinson, 1990].

Johnson and Kaplan [1987] also suggest that the current financial performance indicators used in organisations are the remains of the organisational development of the early twentieth century. Promoted by the advent of decentralised multi-divisional organisational forms in the 1920s and by the inability of organisations to run parallel quantitative information systems for management purposes, financial indicators became the main performance measures used in organisations. As a result of this decentralisation movement, most of the financial performance measures and costing methods still in use today for monitoring, decision-making, and compensation purposes, such as return on equity (ROE) and return on investment (ROI) were developed in the era of "managing by the numbers".¹⁰

Still alive in today's organisations, managing by the numbers, which has relied almost exclusively on quantitative financial information, could explain the continued heavy use of quantitative financial information [Lebas, 1995]. Often trained in staff functions such as finance, human resources, and legal services, rather than line functions, such as marketing/sales or production, top executives and Chief Executive Officers are less familiar with the organisation's processes and often must focus on monthly profit-oriented

¹⁰ Johnson and Kaplan [1987] and Mintzberg [1989] refer to the "syndrome of managing by the numbers" as the manager's perceived ability to make any type of decisions based exclusively on financial information without any knowledge of the underlying characteristics of the organisation's operations and still be successful.

measures and other quantitative financial information rather than quantitative non-financial measures [Norburn and Birley, 1988; Johnson and Kaplan, 1987].¹¹

Current studies suggest that non-financial information may represent an alternative to financial information in solving problems relevant to operational managers and help the organisation to achieve its financial objectives [MacArthur, 1996; Manzoni, 1994; Bruns and McKinnon, 1993; Fisher, 1992; Cooper and Kaplan, 1991; Armitage and Atkinson, 1990]. Operational managers often perceive that non-financial information is directly linked to the organisation's operational processes they control and is expressed in more familiar metrics aligned with those processes than does financial information. For example, the millwrights' supervisor monitors any change in the volume of sawdust (raw material waste) produced in the sawmill by shift as a direct measure of his department's performance. Managers also perceive that non-financial information provides them with relevant information on the current states of the operation processes [Fisher, 1992]. Furthermore, processing non-financial information, which is not influenced by the characteristics of the financial accounting cycle, allows managers to obtain almost on a real-time basis the information they require to intervene rapidly in the operation processes they control [MacArthur, 1996; Lebas, 1994].

For example, producing clothes implies buying rolls of fabric that may contain some weaving defects. To improve the financial results, operational managers would like to identify, at an early stage of the production process, the fabric defects before further transforming raw materials into finished products. To improve the financial results,

¹¹ Another reason is that financial numbers are what is usually communicated to the organisation's principals or owners.

operational managers need to be informed on a real-time basis about the number of defects detected at each step of the production process to undertake corrective actions instead of waiting until a drop in total sales caused by a poor quality product.¹² Monitoring the number and characteristics of customer complaints could also help managers to identify, ex post, similar problems in the operations. In this context, the use of quantitative non-financial information obtained on a real-time basis may help managers to react promptly by correcting an excessive level of fabric defects causing the number of customer complaints to decrease. This early problem detection and prompt corrective action would not be possible with the use of aggregated financial measures because these measures may reflect the financial effects of the loss of customers due to poor quality only two to six months after the occurrence of the problem.

This example illustrates, in essence, what other researchers consider to be an important drawback of quantitative financial information such as cost and profit. Those indicators are the “financial consequences of what took place...they are history” [MacArthur, 1996; Lebas, 1994, p. 39, 1995; Cooper and Kaplan, 1991; Johnson and Kaplan, 1987]. According to this view, quantitative financial information represents the economic results or the effects of different transformation processes of inputs into outputs. Providing instantaneous feedback (information timeliness), quantitative non-financial measures are able to capture the specific nature of inputs, transformation process and outputs without introducing biases caused by faulty costing processes resulting from the monetary quantification (measurement errors) and support managers’ monitoring and

¹² Nanni et al. [1990] use the “thermostat” analogy to explain the characteristic of some indicators to make a diagnostic of a specific problem and to direct the corrective action.

decision-making activities [Lebas, 1994, 1995; Cooper and Kaplan, 1991]. Therefore, the use of quantitative non-financial information reduces potential measurement biases caused by faulty costing processes and allows managers to direct their attention toward the critical activities or processes involved in managing the organisation [Armitage and Atkinson, 1990]. This suggests that non-financial information could be used as a substitute for financial information to reduce the potential of measurement errors and to provide instantaneous feedback to managers on the organisation's processes.

Even though the use of non-financial information is perceived to reduce biases caused by faulty costing procedures, measurement properties are also important to take into account in making decisions about the use of performance indicators. Ijiri [1975] considers that a "hard" quantitative performance measure represents a verifiable and objective indicator that conveys an unequivocal or unambiguous meaning or message about a specific concept or phenomenon that is measured. A specific and hard quantitative performance measure that is "constructed in such a way that it is difficult for individuals to disagree " about its meaning implies the measurement of verifiable facts and the use of a restricted number of measurement rules to limit the possibility of transforming facts into unjustifiable figures [Ijiri, 1975, p.36].

It is important to emphasise that the use of non-financial performance measures does not exclude the use of financial indicators. On the contrary, financial measures present those characteristics of objectivity and verifiability that are considered important to reduce the risk of disagreement among managers about the meaning of financial performance indicators. Although non-financial performance indicators such as the level

of production defects, index of customer satisfaction, or the number of visits to new customers may appear to be more informative to managers who are familiar with the organisation's operations, their meanings and the measurement rules used to obtain those measures may lead to different perceptions of hardness of the non-financial measures among less-experienced managers or information users. Alternatively, financial information can be more easily aggregated while still being meaningful to users as compared to non-financial indicators. For example, the total production cost per unit (or service) may convey an unambiguous meaning about the overall organisation's resources, expressed in the monetary metric, used to produce a unit of output. Alternatively, an aggregate or composite measure of customer satisfaction which could include diverse indices such as on-time product delivery, the number of products returned by customers, and the number of repeated orders received from customers could be difficult to interpret. In such situations, non-financial information could be used as a complement to more aggregated financial information. For these reasons, the managers' use of financial and non-financial performance measures in their mix of information may just be a way for managers to control for their differences in perception of the hardness of the financial and non-financial performance indicators and the level of information aggregation, they rely on for monitoring purposes

Overall, managers seem to perceive differences in the characteristics of financial and non-financial information which may influence the proportion of financial and non-financial performance measures they use in their mix of quantitative information for monitoring purposes [Fisher, 1992; Nanni et al., 1990; Armitage and Atkinson, 1990]. A discussion of those characteristics is important because it allows for a better understanding

of the role that financial and non-financial performance indicators play in the mix of quantitative information managers use in organisations.

Understanding these important characteristics of financial and non-financial performance indicators helps to identify the factors or circumstances that could influence the mix of quantitative information managers use for monitoring purposes. The next section includes a review of the management, cognition, judgement and decision-making, and management accounting literatures with a focus on the important factors or determinants of the mix of information managers use. Along with the literature review, the rationale for the research propositions is also provided for each variable included in the model proposed in this thesis.

2.3 THE INDEPENDENT VARIABLES

2.3.1 The contextual variable: managers' perceived external environmental uncertainty

The concept of environmental uncertainty has long been identified as an important contextual variable in organisational research.¹³ The management and management accounting literatures suggest that as environmental uncertainty increases, managers seek and process more information through organisational devices such as control and monitoring systems and develop different structures to cope with the perceived environmental uncertainty [March and Simon, 1958; Bruns and Stalker, 1961; Lawrence and Lorsh, 1967; Duncan, 1972; Galbraith, 1973; Gordon and Miller, 1976; Waterhouse and Tiessen, 1978; Miles and Snow, 1978; Miller and Friesen, 1982; Gordon and Narayanan, 1984; Chenhall and Morris, 1986; Milliken, 1987; Daft et al. 1988; Gul and Chia, 1994; Mia and Chenhall, 1994; Buchko, 1994, Mangaliso, 1995].

Even though this concept has been intensively probed, only a few empirical studies have attempted indirectly to identify the nature of quantitative information managers use to cope with an increasing level of perceived uncertainty [Gordon and Narayanan, 1984; Chenhall and Morris, 1986; Gul and Chia, 1994; Mia and Chenhall, 1994]. Using a composite measure which also includes the nature of quantitative financial and quantitative non-financial information, those studies focus on the concept of "usefulness" of information or management information systems. Considering the lack of research on the relationship between perceived environmental uncertainty and the manager's mix of

¹³ Environmental uncertainty is the inability of an individual to predict accurately the nature of the environment of an organisation due to a lack of information or to discriminate between relevant and irrelevant data [Milliken, 1987]

information, this thesis relies on those studies to draw inferences from this approximate measure of information usefulness to develop the research propositions in this section.

Milliken [1987, p.136] defines external environmental uncertainty as:

"an individual's perceived inability to predict an organisation's external environment accurately because of a lack of information or an inability to discriminate between relevant and irrelevant data"

Milliken's definition of external environmental uncertainty includes three types of environmental uncertainty that are "effect", "response", and "state or perceived" uncertainty.¹⁴ "Effect uncertainty" is the inability to predict the nature of the effect of a future state of the environment on the organisation. For example, the inability to predict the impact of the arrival of a new competitor on an organisation's total sales (lack of understanding of cause-effect relationships) illustrates the nature of effect uncertainty. "Response uncertainty" is the lack of knowledge of response options and/or an inability to predict the likely consequences of a response choice. For example, the uncertainty that arises either in the process of choosing or formulating the organisation's responses to the arrival of a new competitor to its market. Finally, "state or perceived external environmental uncertainty" occurs when individuals perceive the external environment, which consists of physical and social factors within the boundary of the organisation, as unpredictable.¹⁵ Based on this definition, the inability to predict the future behaviour of a

¹⁴ According to Milliken [1987, p. 137] only "state uncertainty" should be labelled as "perceived environmental uncertainty" because "...it is the only one of the three types of uncertainty that relates directly to unpredictability of the state of the world".

¹⁵ According to Milliken [1987, p. 135], the Duncan [1972] instruments that have been traditionally used to measure the environmental uncertainty constructs refer to unclear information about the complexity and dynamism of the environment. Moreover, the instruments make reference to the firm's performance and decisions of its executives, dimensions that could be related to other constructs such as effect and response environmental uncertainty.

key competitor, whether the government will deregulate one's industry, or the individual's incomplete understanding of the relationship between elements of the environment, all represent examples of environmental state uncertainty. This study focuses exclusively on the "state or perceived external environmental uncertainty" since the only studies that investigated indirectly the nature of information managers used relied on a concept similar to Milliken's description.

Perceived external environmental uncertainty has been captured through the use of perceptual measures of environmental uncertainty in various studies [Gordon and Miller, 1976; Miles and Snow, 1978; Gordon and Narayanan, 1984; Chenhall and Morris, 1986; Gul and Chia, 1994; Mia and Chenhall, 1994]. Perceived external environmental uncertainty, which arises when managers are unable to predict future changes in components of the environment or possess an incomplete understanding of the relationships among the components of the environment, is believed to influence the amount and the nature of quantitative information individuals gather and process to cope with environmental uncertainty [Gul and Chia, 1994; Gordon and Narayanan, 1984].

Miles and Snow [1978] suggest that groups external to the organisation, also known as stakeholders, influence the manager's perception of external environmental uncertainty. The nature and characteristics of the organisation's suppliers, competitors, customers, financial/capital markets, governments, and labour unions along with environmental dynamism, hostility, and complexity are believed to influence the manager's ability to make predictions about the organisation's environment and, consequently, the ix of quantitative financial and non-financial information a manager uses for monitoring and decision making purposes. These characteristics are summarised in Table 1.

TABLE I
PERCEIVED EXTERNAL ENVIRONMENTAL UNCERTAINTY

Level of perceived external environmental uncertainty	Ability to predict change in the environment	Characteristics of the market	Understanding of the relationships among the environment's components	Complexity of the market	Proportion of financial information in the mix of information managers use *
HIGH UNCERTAINTY	Low	Dynamic, hostile	Low	Heterogeneous	Small proportion
LOW UNCERTAINTY	High	Stable, friendly	High	Homogeneous	Large proportion

* For summary purposes, the proportion of financial information included in the mix of information is used to discriminate the effect of the independent variable on the criterion, i.e. the mix of information managers use. The use of relative terms such as "large" and "small" must be interpreted in light of the current evidence that the proportion of financial information included in the mix of information represents less than 40% [Nanni et al., 1990].

Gordon and Miller [1976] suggest that in a stable and friendly environment (e.g. personal hygiene products with high average product life-cycle such as shampoo, razor blades) customer tastes are stable and there is no anticipation of new government regulations. Competitors, suppliers, financial markets, and labour unions tend to behave in a predictable fashion. Moreover, competitors do not engage in threatening actions nor is there a shortage of scarce resources due to strikes, government regulations, or financial problems. In such a situation, managers perceive the environment to be predictable and therefore assign it a low level of uncertainty. As a result of a low perceived environmental

uncertainty, managers tend to use more periodic, aggregated, and ex post quantitative financial information to measure global performance such as cash flow, profit and cost information [Gordon and Narayanan, 1984]. Nanni et al. [1990] also suggest that managers who work in organisations facing a more stable market rely more on financial performance measures than organisations in a less stable market. The stability of the environment and the absence of perceived threats may reduce the need to gather quantitative non-financial and ex ante quantitative information such as customer satisfaction indices and the number of new products introduced by competitors to assess the possibility of potential threats coming from the external environment. Therefore, quantitative financial information that is traditionally produced in the organisation is most likely to satisfy the quantitative information needs of managers.

Alternatively, in the context of a dynamic and hostile environment, where demographic shifts may indicate changes in customer tastes, and where changes in the competitors' actions, labour unions, governmental regulations and financial markets are more rapid and possibly threatening, managers perceive more environmental uncertainty [Gordon and Miller, 1976]. Quantitative financial information alone no longer satisfies the manager's need for quantitative information to anticipate such rapid and possibly threatening changes that cannot be quickly captured in terms of a monetary metric [Gul and Chia, 1994]. For example, the introduction of new products by competitors, changes in customer tastes or revealed preferences for products, and the introduction of new governmental regulations that may be threatening for the organisation can only be captured by non-financial indicators. Consequently, quantitative non-financial information could be more helpful for managers to rapidly and directly monitor the nature of change

that occurs in customer tastes or preferences for products and in the other elements of their external environment as it becomes more uncertain [Nanni et al., 1990; Gordon and Narayanan, 1984].

The complexity of the environment is also very important because of its effect on the manager's understanding of the relationships existing among the components of the external environment [Milliken, 1987]. Gordon and Miller [1976] suggest that as the organisation's external environment becomes more heterogeneous (for example, an organisation that competes in very different markets, with very different products that require different types of production processes or technologies), its environment is perceived as more complex. In order to cope with the perceived environmental uncertainty created by the complexity of the organisation's external environment, managers gather and process more quantitative information and also develop a decentralised organisational structure to operate the sub-segments of the environment [Gul and Chia, 1994; Chenhall and Morris, 1986; Gordon and Narayanan, 1984; Gordon and Miller, 1976].¹⁶

Gul and Chia [1994], Chenhall and Morris [1986], and Gordon and Narayanan [1984] suggest that managers who perceive higher levels of external environmental uncertainty would tend to use a broader scope of information including more non-financial information. The Gul and Chia [1994] results suggest that managers who perceive a higher level of environmental uncertainty would also tend to perceive their organisation as more decentralised.

¹⁶ The limitations of managers' ability to gather and process a great number of pieces of information, i.e. their bounded rationality, is another reason to decentralise the operations into sub-segments. The adoption of a decentralised organisational structure also satisfies control and decision making purposes.

The organisation's environment may also be classified as homogenous in terms of the market segment exploited by the organisation, the customer characteristics, and the organisation's small number of products which require the same types of production processes or technology. In this case, managers perceive a low environmental complexity and consider the level of perceived environmental uncertainty to be low. Gul and Chia [1994] also suggest that these managers will tend to perceive their organisation as centralised. In such a situation, managers will tend to use more quantitative financial information such as profit and cost information to assess the performance of the different departments. This line of reasoning leads to the following propositions:

Proposition 1: Managers who perceive high external environmental uncertainty tend to use a greater proportion of non-financial information in their mix of quantitative information than the proportion of non-financial managers use in low external environmental uncertainty.

Proposition 2: Managers who perceive high (low) external environmental uncertainty tend to work in a decentralised (centralised) organisation.

Only a few studies have attempted indirectly to investigate the relationship between the level of organisational centralisation or decentralisation and the nature of quantitative information used, (financial or non-financial information) with measurement tools such as information or information systems usefulness [Gordon and Narayanan, 1984; Chenhall and Morris, 1986; Gul and Chia, 1994]. Although these studies suggest a relationship between decentralisation (centralisation) and the use of quantitative non-financial (financial) information at the executive level, more research is required to

investigate this association with more complete instruments and for all levels of decision making.

Chenhall and Morris [1986] suggest that the level of centralisation or decentralisation is associated with the nature of the information managers use for monitoring purposes. Gul and Chia [1994] and Gordon and Narayanan [1984] suggest that managers adopt centralised organisational structures when the competitive threat coming from their environment is perceived to be low. Considering that the organisation's processes will be less likely to change due to the absence of competitive threats and that the environment is perceived as more stable, managers can rely more on financial information such as profit or operation cost for monitoring the operation.

Alternatively, managers seem to adopt decentralised structure when they perceive a greater level of threats coming from their environment which requires more flexibility in the organisation's processes to be successful [Gul and Chia, 1994; Chenhall and Morris, 1986]. In such a situation, non-financial information that helps to better assess changes that occur in the environmental characteristics such as competitive threats would appear to be favoured by managers [Gul and Chia, 1994; Gordon and Narayanan, 1984]. This line of reasoning suggests the following proposition:

Proposition 3: Managers who perceive their organisation as centralised tend to use a greater proportion of financial information in their mix of information than the proportion of financial information managers who perceive their organisation as decentralised use.

In summary, the level of environmental stability and complexity, captured respectively by the environmental dynamism and hostility, and heterogeneity are believed to influence the manager's perceived environmental uncertainty which determines the nature of the mix of quantitative information used. Along the same lines, the level of centralisation or decentralisation of the organisational structure is more likely to be associated with the manager's perception of external environmental uncertainty and with the mix of information managers use for monitoring purposes.

2.3.2 Organisational variable: the types of decisions

The accounting literature has identified two main managerial responsibilities: stewardship and decision-making [Gjesdal, 1981]. Stewardship responsibility includes being accountable for the shareholders' investment in the organisation. Managers are also responsible for making decisions relating to many variables such as technology, physical facilities, product lines, etc., to achieve the organisation's objectives, which usually implies maximising the owners' wealth. These design decisions, which must reflect the requirements of the organisation's different stakeholders including suppliers, customers, employees, and levels of government, enjoin managers to gather and process various types of quantitative information.

The management and management accounting literatures have often used management hierarchical levels as a proxy for the types of decisions managers make in organisations [Abernethy and Lillis, 1995; Manzoni, 1994; Bruns and McKinnon, 1993; Fisher, 1992; Armitage and Atkinson, 1990; Nanni et al., 1990; Anthony, 1965]. Based on the well-accepted taxonomy of Anthony [1965], management hierarchical levels such as top, senior managers or executives; middle, plant or divisional managers; and factory-floor or production managers, can be classified respectively into strategic, tactical and operational decisions. This study also adopts this approach for practical reasons related to the selection of managers in the organisations visited.

The literature in judgement and decision-making suggests that the nature of decisions varies in terms of complexity, structure, and the time horizon of their effects [Schwenk, 1995; Ungson and Braunstein; 1982; Newell and Simon, 1972]. Anthony

[1965] used these characteristics but found that only the time horizon discriminates between the type of information managers at different hierarchical levels use to make decisions.

Anthony suggests that as the time horizon lengthens, managers use relatively more quantitative financial information to make their decisions because financial information can be used to directly monitor the achievement of the organisation's objectives such as the long-run value or wealth creation process for its shareholders. Organisations also use and accumulate financial information because it is required by shareholders to monitor managers' actions. Over a long period of time, it could be easier and possibly more economic to accumulate and access financial information records than all possible quantitative non-financial drivers of the organisation's financial performance.

Alternatively, over a short-time horizon such as a day, week, month or even a year, costing and profit information, if available, may provide misleading signals because of accrual and allocation difficulties [Lebas, 1994; Cooper and Kaplan, 1987; Armitage and Atkinson, 1990]. In such a situation, quantitative non-financial indicators may provide information that is free from inevitable accounting problems and focus on the processes that create value. Although potentially biased due to the short time horizon, quantitative financial information is less likely to include accrual and allocation biases in a longer time horizon such as two to five years. However free of financial bias, non-financial performance indicators have also their limitations. Less-experienced managers may find it difficult to interpret non-financial indicators such as customer satisfaction or production efficacy. Managers may also find it difficult to translate the impacts of non-financial indicators in terms of financial results (see Section 2.2.1 for details).

Alternatively, the cost allocation biases are perceived to be less prominent as the time horizons become longer. In short, when time horizons are longer, cost becomes more variable and therefore, reduces the biases created by the allocation of fixed costs. Based on this assertion, financial information could be used to monitor the achievement of the organisation's long-term financial objectives.

Anthony's taxonomy is used to classify the manager's hierarchical position into decision types and helps to identify possible links between the mix of quantitative information managers use and the time horizon of the decisions they make. The characteristics of decisions used to classify managers are summarised in Table 2.

TABLE 2
TYPES OF DECISIONS

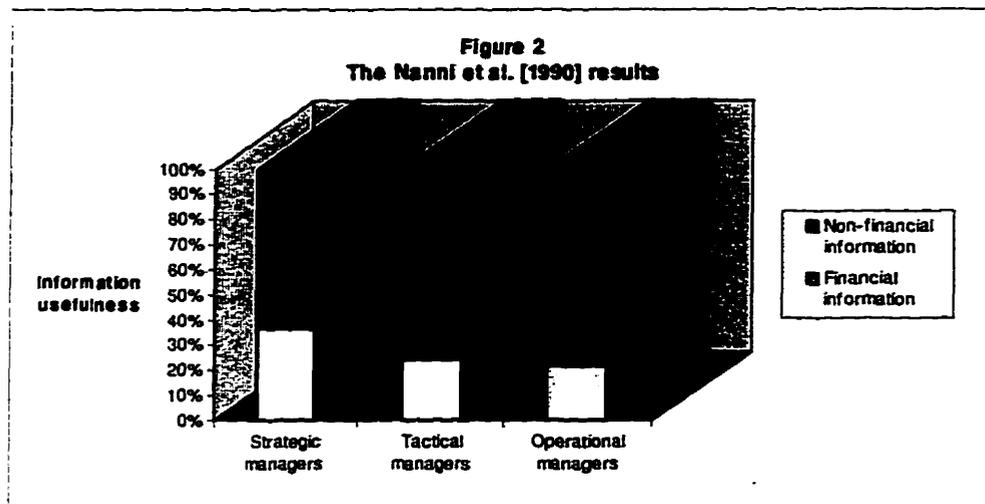
Type of decision	Manager's hierarchical position	Decision complexity	Degree of decision structure	Time horizon	Proportion of financial information used in the mix of information
Strategic e.g.: choosing new product lines	Executive	High	Unstructured	Long-term e.g.: +> 1 year	Large proportion
Tactical e.g.: development of a new product	Divisional, plant, and functional director	Medium	Medium degree of structure	Mid-term e.g. +> 1 week to 1 year	Medium proportion
Operational e.g.: scheduling the production of a new product	Supervisor	Low	Highly structured	Short-term e.g.: 1 day to 1 week	Small proportion

According to Anthony, the strategic level of decision-making refers to :

"the process of deciding on objectives of the organisation, on changes in these objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition, use and disposition of the resources" [p.16]

In essence, strategic decisions made by top, senior managers, or executives consist of general plans that state the direction in which the organisation is heading [Anthony et al., 1992]. Strategic decisions involve a high level of complexity in dealing with factors that may influence the decisions, and a long-range duration, from one to twenty years, of the consequences of decisions that are often irreversible in the short-run. Strategic decisions are considered unstructured and often involve no systematic approach that assures managers of creative solutions. For example, strategic decisions include: establishing personnel, financial, marketing and research and development policies; choosing new product lines; acquiring a new division; and, deciding on capital expenditures, etc. [Anthony et al., 1992].

The Nanni et al. [1990] results suggest that strategic managers consider quantitative non-financial information more useful than quantitative financial information to assess their performance. Moreover, the authors also suggest that tactical and operational managers prefer to use non-financial information over financial information when asked to assess the level of usefulness of both types of information as described in Figure 2.



This may imply that strategic, tactical, and operational managers tend to use a greater proportion of quantitative non-financial information in their mix of information than quantitative financial information. Despite this, strategic managers use a greater proportion of financial information in their mix of information than any other level of decision-making [Nanni et al., 1990]. The stewardship responsibilities of strategic managers might explain their reliance on financial information to assess the achievement of the owners' short and long-term financial objectives. Based on this argument, it appears that the proportion of quantitative financial information included in the information mix that strategic managers are most likely to use will tend to be greater than that of the other two levels of decision-making [Nanni et al., 1990]. This line of reasoning leads to the following propositions:

Proposition 4: Strategic, tactical, and operational managers tend to use a greater proportion of non-financial information in their mix of quantitative information than financial information to make decisions.

Proposition 5: Strategic managers tend to use a greater proportion of financial information in their mix of quantitative information than tactical and operational managers.

Anthony [1965] defines tactical decisions as:

"the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organisation's objectives" and according to the policies determined by the strategic decisions [p.17]

In essence, tactical decisions made by middle managers, divisional, or plant or functional directors refer to the transformation of the strategic decisions into what must be done to achieve the organisation's objectives. This process requires participation from all managerial levels to create an integrative and applied plan to achieve the general goals of the organisation with respect to its policies. Although integrative, tactical decisions are considered less complex and more structured than strategic decisions.

Anthony [1965] suggests that tactical decisions follow a definite and repetitive pattern of middle-range duration decisions such as a month, quarter, a year or two. Tactical managers are perceived to be responsible for creating goal congruence between self-interested operational managers and the organisation's objectives defined by strategic managers [Cooper and Kaplan, 1991; Anthony, 1965]. This implies that tactical managers make decisions that transform the general objectives into detailed measures that are linked to the critical success factors identified by the strategic managers. The development of a new product or brand within a product line, the expansion of a production plan, the establishment of the advertising budget and formulation of advertising programs, the issuance of a new debt, the implementation of a minority recruitment program, etc., all are examples of tactical decisions [Anthony et al., 1992].

Anthony [1965] suggests that tactical managers tend to use quantitative financial information as the common denominator for the heterogeneous elements of inputs,

transformation and outputs captured by quantitative non-financial information. This implies that financial information is more aligned with middle-range time horizons, and that it eases the reporting of the results of heterogeneous conversion processes. Cooper and Kaplan [1991] make a similar argument and suggest that tactical managers have the responsibility to “reconcile between operational and financial measures” to meet the quantitative information needs of strategic managers [p.205]. Such a reconciliation draws its justification from the information aggregation process required for upward reporting purposes. According to this line of reasoning, quantitative financial information provides strategic and tactical managers with simple and more aggregated tools to monitor the organisation’s financial objectives.

The Nanni et al. [1990] results contradict Anthony’s prediction and suggest that tactical managers find quantitative non-financial information more useful than quantitative financial information. Because they receive quantitative non-financial information from operational managers as part of their monitoring devices, tactical managers tend to use more quantitative non-financial information in assessing the achievement of the organisation’s financial objectives. In short, quantitative non-financial indicators of performance are perceived as the drivers of the short and long-term achievement of the organisation’s objectives.

In filling the gap between strategic and operational management levels, tactical managers use performance indicators that allow them to identify the links between the organisation’s various processes and its strategic objectives. Nanni et al. [1990] suggest that the quantitative information mix of tactical managers is most likely to include a

greater proportion of quantitative non-financial than quantitative financial information. Despite this, the tactical manager's mix of quantitative information is most likely to include a greater proportion of quantitative financial information than that of the operational manager [Nanni et al., 1990].

For Anthony [1965], the operational level of decision-making refers to the decisions that:

"assure that specific tasks are carried out effectively and efficiently" [p. 18]

In essence, the nature of the operational decisions made by the lower level of management such as factory-floor managers refers to single and specific low-level tasks or transactions of low complexity. Operational decisions involve a short-time horizon such as a day or at the most a week. The operational decision is very structured or programmed which allows for the use of programmed decision rules and the development of detailed procedures manuals [Perrow, 1967; MacIntosh, 1981]. Operational managers tend to rely on indicators or measures that are directly linked to the task or transaction itself to monitor their processes and to inform tactical managers about the achievement of their respective objectives. Managing customer credit lines, production scheduling, the booking of television commercials, cash management, the execution of an individual research project, inventory control, etc., all are examples of operational decisions [Anthony et al., 1992].

Anthony [1965] suggests that operational managers use more quantitative non-financial information than other levels of management use to support their decisions. Nanni et al. [1990], Fisher [1992], and Bruns and McKinnon [1993] provide support for

this proposition. Using quantitative non-financial information allows managers to develop productivity measures that capture the nature of the processes for which they are accountable. These quantitative non-financial measures provide timely and direct feedback to operational and tactical managers in units of measure that are most likely to be understood by operational managers and by their workers [Bruns and McKinnon, 1993; Fisher, 1992]. Therefore, the quantitative information mix of operational managers is most likely to include a greater proportion of quantitative non-financial information than quantitative financial information. These lines of reasoning lead to the following proposition:

Proposition 6: Tactical managers tend to use a greater proportion of financial information in their mix of quantitative information than operational managers.

In summary, the level of decision complexity, the degree of structure, and the time horizon of a decision represent the important criteria of Anthony's classification of a decision into strategic, tactical, and operational types and are captured by the managers' hierarchical level in the organisation. The most important of these criteria, the time horizon of a decision, helps in identifying the nature of the quantitative information mix managers are most likely to use to support their decisions.

2.3.3 Organisational variable: the nature of the task-technology

Organisational technology, for example, the production equipment or the transformation process of inputs into outputs, represents one of the most widely studied determinants of the organisation's structure. Technology is also believed to influence the nature of the information used within the organisation [Abernethy and Lillis, 1995; Fisher, 1994; Parthasathy and Sethi, 1992; Brownell and Merchant, 1990; Daft et al., 1988; MacIntosh and Daft, 1987; Withey et al., 1983; MacIntosh, 1981; Waterhouse and Tiessen, 1978]. Although insightful, none of these studies focuses specifically on the relationship between the task-technology and the mix of quantitative information managers use in organisations. This study attempts to fill this gap.

Diverse definitions of technology have been provided over the years such as the type of machinery or automation used, work flow, or perceived worker tasks each reflecting the study's focus [Abernethy and Lillis, 1995; Parthasathy and Sethi, 1992; Thompson, 1967; Perrow, 1967]. This dissertation relies on the well-accepted Perrow's definition of task-technology because it conforms to the individual level of analysis used in this study, that is, the factors that influence the mix of quantitative information a particular manager uses.

Perrow defines technology as a series of "actions or processes that an individual performs upon an object, with or without the aid of tools or mechanical devices" to transform input resources into outputs [p.195]. Relying upon the level of analysability and the number of exceptions contained in the worker's tasks, Perrow's technology taxonomy allows for a classification of processes or individual tasks into four different categories: 1) routine technology, 2) engineering technology, 3) craft technology, and 4) nonroutine

technology. To provide a better discrimination between the effects of the task-technology on the mix of information a manager uses, this study uses only the two extremes of this taxonomy, the routine and nonroutine technologies.

Perrow's taxonomy of technology classifies the organisation's numerous tasks or processes into two dimensions according to task variety and analysability. The level of task variety depends upon the frequency of unexpected and novel events or exceptions that occur in converting inputs into outputs [Perrow, 1967; MacIntosh, 1981]. A task is considered of low variety when it involves a small number of exceptional cases or unexpected situations or problems, for example, in situations involving stimuli that are perceived to be unfamiliar. In this case, the task is perceived to be repetitive. For example, the work on an assembly line is considered repetitive. On the other hand, the task will be considered of high variety when it involves a series of unrelated problems and many exceptions.

The analysability dimension refers to a situation in which the worker's response to problems or exceptions requires an information search process, that is either a formal and logical process or a process based only on experience, intuition or guesswork to solve problems of diverse levels of specificity [Perrow, 1967; MacIntosh, 1981].¹⁷ A transformation or conversion process of inputs into outputs is classified as analysable when it can be divided into mechanical steps that are well understood and which allow workers to initiate a formal information search to access stored knowledge and use other

¹⁷ Research in cognition suggests that experienced individuals develop mentally a set of causal relationships between concepts that they have encountered which act as a heuristic to select cues of information for decision making and problem solving [Matlin, 1989]. Along the same lines, individuals also develop a causal representation of the task's processes which is used for making work-related decisions.

procedures such as instructions, manuals, standards and hand-books, to solve problems [Perrow, 1967; MacIntosh, 1981]. For example, the tasks on an assembly line can be classified as analysable. For Daft and Lengel [1986], this situation represents a low level of equivocality because of the low level of ambiguity and confusion that may arise from a restricted number of unexpected situations or problems on the assembly line.¹⁸ Table 3 presents a summary of these characteristics of task-technology.

TABLE 3
PERROW'S TASK-TECHNOLOGY

Type of task-technology	Number of exceptions in a process	Level of analysability of a process	Equivocality	Stability and predictability of a process	Proportion of financial information in the mix of information
ROUTINE TECHNOLOGY e.g.: Assembly line	Few	High	Low	High	Small proportion
NONROUTINE TECHNOLOGY e.g. Research and development	Many	Low	High	Low	Large proportion

¹⁸ Daft and Lengel [1986, p. 556] define equivocality as the ambiguity resulting from the existence of "multiple and conflicting interpretations and absence of consensus about an organisation situation" or problem

Alternatively, when problems arise in a task that is not well understood, when the related cause-effect relationships are unclear, and when there is no stored knowledge or procedures available to resolve a specific problem, this task is considered unanalysable. The individual may use his own judgement, intuition, or experience to quickly solve a problem without having specifically thought it through. Some individuals may draw from their past experience leading them to use some quantitative measures that have been successful in resolving a problem similar to the one they now are encountering. Others may spend a great amount of time thinking about the problem. In these cases, there is no assurance that the solution to the problem is certain due to the novelty of the problems and the limitation of the information available. For Daft and Lengel [1986], this situation represents a high level of equivocality because of the high level of ambiguity and confusion that may arise in the production setting due to the novelty of unexpected problems.

The analysability and variety dimensions of a task also include a concept of uncertainty that affects the predictability of a transformation process [Perrow, 1967; Victor and Blackburn, 1987; Souder and Moenaert, 1992]. When a task contains only a few exceptions and is well understood, it involves little uncertainty and can be perceived to be predictable. As the variety of the task increases and the search process for solutions to a problem becomes restricted by the amount of information available, the amount of uncertainty attached to the process becomes greater and therefore, it becomes less predictable. Researchers consider that a predictable task can be automated and that control mechanisms such as quality control can be integrated into the manufacturing technology itself (e.g. optic sensor of quality used in a paper mill machine to scan for

defects in the paper) [Bronwell and Merchant, 1990]. Since a manufacturing technology with an integrated quality control system relies heavily on physical metrics (non-financial measures) to control the conversion process, it is conceivable that the ability to make predictions about the task outcome may influence the nature of the measures used to monitor a conversion process.

The task variety and analysability dimensions allow for the classification of tasks into routine and nonroutine technology. In each case, the type of technology used prescribes the nature of the information managers use for monitoring and decision-making purposes. In a situation where the process is characterised by a low task variety and the task is analysable, the technology used is a routine technology [MacIntosh, 1981; Perrow, 1967]. An assembly line or a paper mill process represent routine technologies. When workers understand a process that contains few exceptions, the process is predictable. In such a situation, workers can identify non-financial productivity measures that reflect the process characteristics [MacIntosh, 1981]. Fisher [1992] suggests that both strategic and operational managers can use detailed non-financial measures to monitor important processes. For example, non-financial performance measures such as the number of units produced or the level of product quality produced by a process could be used to monitor the performance of an assembly line considered as routine technology. This suggests that managers who perceive their task as routine may tend to rely more on non-financial information than financial information for process monitoring purposes.

Reflecting a different perspective, Birnberg et al. [1983] suggest that managers may instead use more financial information in the situation where a process contains only a few exceptions and is highly analysable. This view reflects the implicit assumption that all

managers understand the cost-process relationship, which is perceived to be stable and predictable, at least, over the short-run [Cunningham, 1992]. Knowing such a cost-process relationship, managers could be more likely to use financial information as a substitute for non-financial information to monitor a specific conversion process. The use of the cost-process relationship could also be limited by other factors such as the individual's preference for non-financial metrics or his lack of costing or accounting knowledge. Since there is no real empirical support for the existence of such an individual's perceptions of cost-process relationships, this study adopts the argument that managers who perceive their task as more routine will tend to use more non-financial performance indicators than financial indicators for monitoring purposes.

Alternatively, when a task or process contains many exceptions, the cause-effect relationships involved in the process are not well understood and little information or documentation exists to solve problems [MacIntosh, 1981; Perrow, 1967]. In such a situation, a nonroutine task-technology is required for the accomplishment of this process. For example, research and development activities and strategic planning require a nonroutine technology. In the presence of a nonroutine technology, the process contains many exceptions and is also difficult to analyse. In such a situation, it would be very difficult for managers to identify in advance the quantitative non-financial measures to control an unstable conversion process that may be altered by workers' actions and other unpredictable factors. Consequently, more general and aggregated financial measures might better help executives to monitor such unstable and complex processes which may be associated with a nonroutine technology [Kaplan, 1984].

For example, in the Texas Eastman Chemicals Division case study, Kaplan [1984] suggests that simple financial information such as an income statement, can help managers and workers to monitor highly complex production processes. In such a situation, the development and use of multiple non-financial indicators is very difficult, and the indicators do not provide feedback about their combined effects on the production process.¹⁹ Alternatively, traditional monthly financial or costing reports are considered out of date, and do not include the effect of the latest actions on the results. Therefore, production managers and workers often pay little attention to this type of information that “is received too late for analysing the financial consequences for most operating decisions” [Cooper and Kaplan, 1991, p.217]. To solve this problem, the divisional manager of Texas Eastman Chemicals Division developed a simple daily income statement using the quantities of outputs produced and inputs consumed to which he assigned respectively estimated selling prices, depending on the output’s quality level and current unit costs. This simple tool helped managers and workers to understand the global impacts of their daily actions on a very complex production process and also fostered process improvement. This suggests that managers who perceive their work as nonroutine would tend to rely more on financial information than on non-financial information for process monitoring purposes.

¹⁹ Kaplan’s claim is that financial information provides an aggregated view or model of what is going on in the production process that forces the managers to consider all the variables.

This line of reasoning leads to the following proposition:

Proposition 7: Managers who perceive their task-technology as routine tend to use a greater proportion of non-financial information in their mix of information than managers who perceive their task-technology as nonroutine.

In summary, using Perrow's description of technology allows for a better discrimination between the effects of task-technology (routine vs nonroutine) on the mix of quantitative information managers use. As managers perceive their task as a routine task-technology, they tend to use a greater proportion of non-financial information in their mix of information than financial information. Alternatively, in a nonroutine task-technology, managers tend to use a greater proportion of financial information in their mix of information than non-financial information. Therefore, a better understanding of the effects of the manager's task-technology could help to develop information systems that are more closely aligned with the manager's need for information.

2.3.4 Organisational variable: managers' perceptions of the reward systems

The nature of reward systems, management compensation contracts, and their impact on the firm's performance are important issues that have generated a great deal of interest in management accounting research considering the motivational aspects of reward systems for individuals. Using an agency or a behavioural approach, researchers have studied the characteristics of reward systems used to control and motivate individuals in aligning the workers' objectives with the organisation's value maximisation objective [Atkinson et al. 1996; Atkinson and Waterhouse, 1996; Young et al., 1993; Pavlik et al. 1993; Baiman, 1990; Baker et al., 1988; Lawler, 1987; 1976].

In both the agency and behavioural approaches, when the important premise is satisfied (i.e., when the individual's reward is tied, as closely as possible, with specific performance measures or the achievement of specific objectives), managers tend to focus their attention on the performance measures that are used to assess their performance [Cammann, 1976; Hopwood, 1972]. Relying on this premise, this study relies on the behavioural or perceptual approach, that is, the managers' perception of financial and/or non-financial indicators used to assess their performance and allocate their rewards. By investigating the relationship between the manager's perception of performance indicators used to assess their performance and the mix of information strategic, tactical and operational managers use, this study provides more current evidence on the managers' performance "indicators fixation".

Tying the reward systems to the performance measurement systems means making employee rewards contingent on their performance. This implies that managers must be

able to measure outputs and understand the process that the organisation uses to transform inputs into outputs. In the presence of a well understood transformation process, which often characterises a routine task-technology, organisation planners can design a set of rules and non-financial measures to monitor the subordinate's performance [MacIntosh, 1981; Ouchi, 1979; Perrow, 1967].

Alternatively, when the transformation process is not well understood or is unobservable, for example, in a nonroutine task-technology, managers may have a limited understanding of the processes which may result in their inability to develop a set of specific non-financial indicators reflecting the characteristics of the organisation's processes [Perrow, 1967]. In this situation, managers may rely more on financial measures, such as cost per unit or achievement of the departmental financial budget, to assess the subordinate's performance [Ouchi, 1979; MacIntosh, 1981].

Organisational researchers have also studied the effects of feedback provided by control or reward systems on the subordinate's responses such as performance [Fisher and Govindarajan, 1993; Young et al., 1993; Birnberg et al., 1983; Cammann, 1976; Hopwood, 1972]. By making the rewards contingent upon good performance, the subordinate could be influenced to exert more effort depending on the attractiveness of the reward. This could also influence the individual's perception of succeeding at the task or encourage behaviour to achieve the desired outcome because the reward acts as a feedback mechanism for the individual's performance [Lawler, 1987; 1976]. Considering the role played by reward systems in the determination of the individuals' motivation to

exert effort, providing subordinates with performance feedback could also influence their level of effort and inform them about their level of reward [Young et al., 1993].

Hopwood [1972] suggests that individuals who want to look good worry primarily about performance measures. This implies that subordinates may focus on the performance measures they perceive their superiors use to reward their level of performance. Focusing on these measures of performance could also help subordinates predict the level of reward they will obtain.

Camman [1976] provides some support for this assertion. Controlling for participation in decision-making and job difficulty, Camman's results suggest that subordinates who believe that their superiors rely on contingent control systems for reward allocations tend to exert a greater level of effort only when subordinates were closely monitored or when they had to work hard to perform well in a difficult job.²⁰ Otherwise, subordinates engage in defensive or dysfunctional behaviour including creating slack in budgets and altering the information to keep their performance measures high.

Libby [1996], who studies the effect of fairness in a budget setting, provides support for the role of individuals' perception in the emergence of dysfunctional behaviour. Using different compensation schemes in a laboratory setting, Libby suggests that subjects, who perceive they are treated fairly by their superiors and are assigned an

²⁰ A body of research in management accounting suggests that the development of reward systems may be determined by the organisation strategy and corporate governance structure [Ittner et al. 1995]. This suggests that reward systems can be interpreted as an endogenous variable. However, the approach used in this dissertation considers the nature of the indicators that managers perceive their superiors use to assess and reward subordinates' level of performance. Since it is possible that the manager's perception of the nature of the performance-reward indicators may differ from the true measures that his superiors use to reward his performance, the nature of the indicators managers perceive their superiors use for reward purposes is considered an exogenous variable in this dissertation.

achievable non-financial number of units to be produced, will create less budget slack and will perform better than others who do not receive fair treatments.

Along the same lines, Birnberg et al. [1983] suggest that dysfunctional behaviour, such as distorting the information systems, will occur when individuals are rewarded based on performance. The use of “hard” measures, i.e., standardised and verifiable measures, directly tied to the organisation’s process, for example, the amount of waste or the number of units produced, could help to reduce or even avoid in certain circumstances such information distorting behaviour.²¹ Considering that non-financial measures, capturing the characteristics of the organisation’s processes, or financial performance measures, relying on historical cost information, could be considered “hard” measures according to the Ijiri [1975] criteria, these measures could limit the emergence of dysfunctional behaviour and provide accurate performance measures for reward purposes.

Compensation schemes that are contingent on financial measures can induce individuals to focus their attention differently. Coates et al. [1995] study the relationship between the nature of executives’ incentive schemes and the types of financial performance measures executives use in Germany, the United Kingdom (U.K.) and the United States (U.S.). Focusing mainly on financial measures, Coates et al. found that German organisations adopt incentive schemes that focus on broad performance indicators and that are long-term oriented such as the long-term profit sales margin for the whole organisation. Alternatively, U.K. and U.S. organisations are more short-term oriented and use a balanced mix of narrow and broad financial performance indicators such as the

²¹ The possibility of lying about performance or manipulating the performance measures still remains due to the limitations in auditing these measures and the related cost-benefit of the audit.

return on assets of specific organisation's divisions and the long-term profit sales margin for the whole organisation.

Ittner et al. [1995], who study the nature of information used in annual bonus contracts, also suggest that managers focus on the performance measures (financial or non-financial performance indicators) used in allocating their rewards. The Ittner et al. results imply that firms adopting an extensive quality programme tend to place more weight on non-financial measures such as customer satisfaction indices in the executive bonus contracts than firms that do not have specific quality programmes. This evidence provides support for a relationship between the types of reward systems used and the tendency of managers to focus on the types of performance measures used for rewarding their performance.

In general, research suggests that individuals do focus on the measures that are used to assess their performance. In certain situations, individuals may exert a greater level of effort or engage in behaviour that distorts information to maintain their "perceived" and not their "true" level of performance at a high level. However, the use of hard performance measures could reduce the emergence of such dysfunctional behaviour. As Hopwood [1972] and Waterhouse and Tiessen [1978] suggest, management accounting systems, including reward systems, may increase the visibility of consequences in appraising performance of individuals or the organisation. Using a reward system contingent on "hard" performance measures could increase the visibility of the consequences and influence the mix of quantitative information all managers use in the organisation.

This line of reasoning leads to the following proposition:

Proposition 8: Managers who perceive that their performance is rewarded based on non-financial measures tend to use a greater proportion of non-financial information in their mix of information than managers who perceive that their performance is rewarded based on financial measures.

In summary, knowing the managers' perception of the type of performance indicators (financial and/or non-financial) they believe their supervisors use to assess the managers' performance could explain the managers' focus on those performance measures. Considering that individuals direct their attention to the performance measures they perceive to be important in assessing their performance, this "indicators fixation" could influence the mix of information managers use for monitoring and decision making purposes.

2.3.5 Organisational variable: the organisation's strategy

Over the past twenty-five years, there has been a growing interest in research on strategy and related issues such as organisational structure, the design of control systems, and strategic planning [Jennings and Seaman, 1994; Hart and Bandury, 1994; Veliyath and Shortell, 1993; Dvir et al., 1993; Zahra and Covin, 1993; Dent, 1990; Simons, 1987; 1990; Zajac and Shortell, 1989; Segev, 1989; Govindarajan, 1988; Govindarajan and Gupta, 1985; Hambrick, 1983; Mintzberg and Waters, 1982; Miller and Friesen, 1982; Porter, 1985; 1980; Miles and Snow, 1978; Mintzberg, 1978]. Even though some strategy issues have been intensively studied, no one has specifically looked at the impact of the organisation's strategy on the mix of quantitative information managers use.

The Miles and Snow [1978] typology of strategy relies on a rich description of behaviour patterns that includes the key elements of strategy, structure, process and provides some insights about the type of information managers might use. This typology has been the most widely used and empirically tested over the last twenty years [Gosselin, 1996; Veliyath and Shortell, 1993; Thomas et al., 1991; Zahra and Pearce II, 1990; Shortell and Zajac, 1990; Segev, 1989; Zajac and Shortell, 1989; Simons 1987, 1990; Hambrick 1983]. This study uses the two extremes of Miles and Snow's typology of organisational strategy (Defender and Prospector) as in Simons [1987, 1990] to investigate the possible effects of strategy on the mix of information managers use for monitoring purposes.

According to Miles and Snow [1978, p.3], strategy is:

a pattern of behaviour or action established through a dynamic process that allows the organisation to maintain an effective alignment with the environment, to cope with environmental changes and uncertainty “while effectively managing internal inter-dependencies”

Reinforcing the dynamic nature of the alignment process of the organisation's strategy and its internal activities with its environment, this definition also emphasises the individual's contribution in defining the organisation's strategy that takes form through the consistency of behaviour or actions undertaken by managers over time. In that sense, this definition of strategy conforms with Mintzberg's notion of “realised” strategy implying that a strategy takes form “when a sequence of decisions in some area exhibits a consistency over time” [p.935, 1978]. Most importantly, the Miles and Snow [1978] definition provides insights about the role of organisational problems of adaptation, i.e. the entrepreneurial, engineering, and administrative problems in determining the nature of the information used for monitoring the organisation's environment and its internal activities [Simons, 1990].

For Miles and Snow, the entrepreneurial problem refers to the specification of the organisational domain in terms of specific goods (services) and target markets. The managers' choice of a specific product-market domain and the allocation of resources to take advantage of the opportunities offered by the chosen domain resolves the entrepreneurial problem. It also creates a focus within the organisation and provides outsiders with an identification of the organisation's market orientations.

The choice of product-market domain raises the engineering problem. Managers must select the appropriate technology, i.e. input-transformation-output, to produce and

deliver the product (service) to customers [Dvir et al., 1993]. Although the solution to this problem may be incomplete, the redefinition of the organisation market-segment domain may imply change in technology from a mass-production to a unit or small-batch technology [Miles and Snow, 1978].

Resolving the administrative problem means reducing the uncertainty within the organisation's systems by stabilising and rationalising the process. The creation of the administrative systems helps to direct and monitor the organisation's processes and to foster technological and product innovation. The administrative structure created in resolving this problem implies gathering, processing and communicating information within the organisation to monitor and improve its processes and to adjust its strategy. Resolving these three organisational problems by identifying market, technology, structure, and process provides the basis for the classification of organisations according to their strategic orientation or pattern of behaviour. It also provides some indication of the nature of quantitative information managers tend to use in solving these three problems.

Defenders and Prospectors constitute the two extremes of the strategy typology and therefore, present distinctive characteristics such as market-segment, technology, organisational structure, top-management group, and propensity to innovate which may also influence the nature of the information and information systems used in organisations [Simons, 1987; 1990]. The use of the organisation's strategy as a composite measure capturing the individual effects of these factors on the manager's mix of information helps to provide a combined prediction of those effects on the mix of information used. Table 4 presents a summary of the characteristics of the Defender and Prospector strategies.

TABLE 4
ORGANISATIONAL STRATEGY

Type of strategy	Type of environment	Number of products	Type of technology	Organisational structure	Dominant group in the management team	Proportion of financial information in the mix of information used
DEFENDER	Stable, homogeneous, and friendly	Few	Routine	Centralised	Production	Small proportion
PROSPECTOR	Dynamic, heterogeneous, and hostile	Many	Nonroutine	Decentralised	Marketing and R&D	Large proportion

Defenders exploit and maintain a small niche within their industry [Simons, 1987; 1990; Miles and Snow, 1978]. Defenders tend to grow through market penetration and limited product development and consequently, they tend to exist in stable, homogenous, and friendly environments [Zajac and Shortel, 1989; Miller and Friesen, 1982]. Making a large investment in a single technical core, Defenders are most unlikely to resist market shifts [Yasai-Ardekani and Nystrom, 1996; Miles et al., 1978]. However, this approach allows Defenders to seal off their unique technological core and focus on cost-efficiency by restricting the number of products marketed. Based on Perrow's classification, Defenders tend to use a routine technology [Miles et al., 1978]. Such a focus on a single

technological core and cost-efficiency allows Defenders to be vertically integrated and to adopt a centralised structure. Relying on the Burns and Stalker [1961] organisational structure typology, Defender organisations present the characteristics of a mechanistic organisational structure [Miles et al., 1978]. Souder and Moenaert [1992] suggest such a relationship between environmental stability, routine technology, and mechanistic organisations. Dominating Defenders' top management group, production and cost-control specialists tend to innovate mainly in technological and process innovation type [Thomas et al., 1991; Norburn and Birley, 1988; Miles and Snow, 1978].

The prediction of the nature of the quantitative information mix managers use in organisations adopting different strategic orientations is a difficult task considering the number of information determinants to take into account and the absence of specific evidence on the direction of the effect of strategy on the mix of information used. Defenders that operate in a stable, homogenous, and friendly environment, may use more aggregated financial information [Simons, 1987; 1990]. The use of a routine task-technology fosters the use of non-financial measures that are directly linked with stable processes or cost-process information, depending from which branch of the literature the evidence is drawn [Bruns and McKinnon, 1993; Fisher, 1992; Cunningham, 1992; Birnberg et al., 1983; MacIntosh, 1981]. Using a single core of technology, the organisation's processes, which remain stable and predictable, favour the use of non-financial information. The fact that the dominant group in the management team usually comes from the production side of the organisation could also reinforce the use of non-financial measures based on the managers' greater level of process knowledge and cause-effect relationships. Based on their understanding of the organisation's processes, this

influential group of managers could also infer the financial impacts from the fluctuation occurring in the organisation's processes captured by non-financial indicators [Cunningham, 1992; Bruns and McKinnon, 1993].

Anecdotal evidence suggests that organisations in the natural resource industry, such as paper mills, pulp mills, or sawmills, routinely develop measures that relate changes in financial results to changes in operation yields [Armitage and Atkinson, 1990]. For example, Weirton Steel, a U.S. steel products manufacturer, estimates that each point increase in its raw material yield is equivalent to a 4.7 million dollar decrease in its operating costs [Atkinson et al., 1997]. By knowing the cost-process relationship, managers' ability to use quantitative non-financial and financial information interchangeably could influence the type of information they use for monitoring purposes [Cunningham, 1992].

Waller et al. [1995] and Dearborn and Simon [1958] suggest that managers tend to express biases in their perception of problems and information demands to reflect their functional area of experience. Considering the dominance of managers with an operations background in Defender organisations and the greater focus on internal activities or processes, this implies that these managers may be more likely to use a greater proportion of non-financial information than financial information [Thomas et al. 1991; Simons 1987; 1990].

Alternatively, Prospectors are perceived to be more dynamic in exploiting new products and market-opportunities [Simons, 1987, 1990; Miller and Friesen, 1982; Miles and Snow, 1978]. This requires a greater ability to innovate and to monitor their external

environment in order to locate and exploit market opportunities in developing new products [Yasai-Ardekani and Nystrom, 1996; Zajac and Shortell, 1989]. Prospectors also tend to use a variety of environmental scanning devices to monitor a broader range of environmental conditions, including the environment outside of the organisation's current domain [Simons, 1987; 1990]. Providing a large diversity of products to different markets, Prospectors require a flexible and multi-technological core [Miles and Snow, 1978]. The nature of their technology requires a low degree of routinisation and mechanisation to avoid long-term resource and technology commitments. Building on Perrow's taxonomy, the nature of the technology Prospectors use is more aligned with a flexible technology or a nonroutine task-technology. To deal with product and technology diversity and to allow the organisation to cope with a broader range of environmental conditions, Prospectors tend to adopt a decentralised structure with a low degree of formalisation [Miller and Friesen, 1982]. Such characteristics are representative of an organic structure [Burns and Stalker, 1961]. Souder and Moenaert [1992] suggest such a relationship between the unstable environment, nonroutine task-technology and organic organisations.

To control and monitor such product and market diversity, the top management group is dominated by marketing and research and development experts [Thomas et al., 1991; Norburn and Birley, 1988; Miles and Snow, 1978]. This concentration of managers coming from these functions could indicate a preference for a broader scope of information including non-financial information, such as customer satisfaction indices, demographic indicators, product features, and any other related indicators which are more aligned with the diversity of the operations to be controlled and external environment to

be monitored [Mia and Chenhall, 1994]. However, the cognitive literature suggests that managers have cognitive limitations which may restrict their ability to manipulate a greater diversity of information that characterises the use of various non-financial indicators [Newell and Simon, 1972; Schroder et al., 1967; Simon, 1955]. Consequently, those managers who deal with a great variety of information and who continuously face marketing and product development issues such as market or pricing strategy and product cost may tend to develop functional area biases and therefore, lead them to use more aggregated and financially oriented information [Waller et al., 1995; Rosman et al., 1994; Dearborn and Simon, 1958].

The need to monitor and control the Prospectors' greater variety of operations, as compared to the Defenders', plays against the use of multiple non-financial indicators. Since quantitative non-financial information is difficult and almost impossible to aggregate, its use may be limited but not totally absent as a monitoring device for some critical organisational processes. Considering the level of technology flexibility required to cope with the Prospectors' high product diversity, it is conceivable that managers may also experience information overload due to heavy use of non-financial indicators. To avoid information overload, managers may include a greater proportion of aggregated financial measures in their mix of information than managers in Defender organisations to monitor the organisation's processes and to make decisions.

These lines of reasoning lead to the following proposition:

Proposition 9: Managers in Defender organisations tend to use a greater proportion of non-financial information in their mix of information than managers in Prospector organisations.

In summary, the strategy adopted by an organisation can be categorised according to the managers' responses to the entrepreneurial, engineering and administrative problems. The Miles and Snow's typology of strategy provides a well-accepted tool to classify organisations based on the characteristics of their market-segment(s), technology, structure and the dominant group in the top management team. Widely used in the management and management accounting literatures, the use of the two extremes of Miles and Snow's typology (Defender and Prospector strategy) may help to discriminate between the mix of quantitative information managers use in each type of organisation.

2.3.6 Managers' perceived causal relationships among performance measures

Anecdotal evidence of managers' preferences for specific types of quantitative information, sets of indicators, or performance measures induced by their training and work experience is common in organisations [Fisher, 1992; Bruns and McKinnon, 1993]. Furthermore, these anecdotes describe managers' monitoring of organisation processes using a limited set of indicators that they believe affect their ability to meet their financial budget and the organisation's financial performance [Bruns and McKinnon, 1993; Kaplan, 1984]. Measurement properties and individuals' characteristics including education, training, and experience provide a rich platform to investigate the factors that influence the manager's selection of performance indicators and consequently the mix of quantitative financial and non-financial information he uses.

Revisited in the late eighties, measurement issues have helped to refocus the research in performance measurement toward the use of non-financial organisational performance indicators [Johnson and Kaplan, 1987; Cooper and Kaplan, 1991; Fisher, 1992]. Traditional financial performance measures such as cost per unit or profit which are unavailable on a timely basis are often considered by managers as too aggregated and too late. Non-financial measures are perceived to be alternative or supplemental performance indicators that overcome the problems of financial measures [Fisher, 1992; Cooper and Kaplan, 1991; Johnson and Kaplan, 1987]. Ijiri [1975] discusses the ability of a financial or non-financial indicator to act as a surrogate or substitute measure for a specific construct or phenomenon. This measurement property could help in

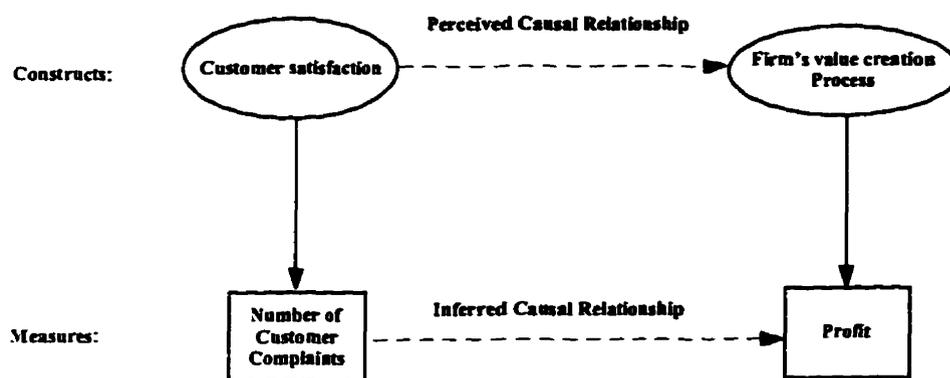
understanding the manager's choice of performance indicators and, consequently, the mix of quantitative information used for monitoring purposes.

Measurement theory states that a measure or indicator has the ability to act as a surrogate or proxy for a construct (e.g. to capture a specific construct or phenomenon such as customer satisfaction or the firm's value creation process) and to communicate its state (e.g. high level of customer satisfaction). For example, financial statements act as a surrogate "for some aspects of the economic states" of an organisation such as the firm's market value and the daily number of customer complaints could proxy for the level of customer satisfaction [Ijiri, 1975, p. 41].²² In addition, the level of precision or perfection of a measure to correctly communicate at any given time the specific state of a construct or phenomenon is very important for measurement accuracy which determines the level of identifiability of an indicator.

According to measurement theory, two phenomena or constructs can be related through a cause-effect relationship or causal link. Building on the existence of a causal relationship between two constructs or phenomena, for example customer satisfaction and the firm's value creation process, inferences can be made and applied to the constructs' respective surrogates. Figure 3 illustrates this inference.

²² Ijiri's statement implies that non-financial constructs such as employee satisfaction or product quality could also influence the firm's value creation process.

Figure 3
Perceived Causal Relationships



The perceived causal relationship between customer satisfaction and the firm's value creation process is applied to their respective surrogates, the number of customer complaints and the firm's profit. Based on the stability of the perceived cause-effect link existing between two constructs and the level of identifiability of each construct's surrogate, a manager could prefer to use only the measure that drives the "effect" (e.g. the number of customer complaints) instead of delaying his information demand to obtain the firm's monthly profit for monitoring purposes. This could imply that managers who perceive such cause-effect relationships between non-financial and financial constructs could rely heavily on non-financial indicators, available on a daily or weekly basis, to monitor the achievement of the organisation's financial objectives. Consequently, the mix

of quantitative information those managers use would include a greater proportion of non-financial indicators than financial indicators.

The empirical evidence of such perceived causal relationships between financial and non-financial indicators in accounting is very limited. Using archival data, Curtis [1994] is one of the few studies in management accounting that has specifically investigated the relationship between a set of non-financial indicators and the financial performance of organisations involved in intensive research and development activities. Curtis' predictive model explains ninety percent of organisations' earnings before interest and taxes and provides some support for the existence of cause-effect links between financial and non-financial indicators.

Only a few case studies provide some evidence, often unsettling, of the manager's perception of the cause-effect relationship between financial and non-financial indicators. Bruns and McKinnon [1993] suggests that managers who perceive underlying causal links between some non-financial indicators and the financial performance of a production plant or organisation tend to rely on the non-financial measures that drive the financial performance of their department or organisation for monitoring purposes and in their communication with employees. Alternatively, Kaplan's Texas Eastman Chemicals Division case study sheds light on the development of simple administrative tools, mainly financial indicators, to monitor the division's financial performance when the production process becomes too complex and requires managers to manipulate a large number of non-financial indicators [Cooper and Kaplan, 1991].²³

²³ The plant manager developed a daily income statement based on the main consumption factors of resources and the level of output produced by the chemical process.

Fisher [1992] suggests that the major concern managers have with the use of non-financial indicators is that they do not perceive a direct link between financial and non-financial performance measures. This suggests that some individual differences such as the manager's experience or ability to perceive causal relationships between phenomena in diverse levels of organisational complexity could influence the choice of indicators for monitoring purposes. The cognition and judgement and decision-making disciplines could help to disentangle this conflicting evidence and provide support for the manager's reliance on the cause-effect links existing between non-financial and financial indicators as part of a heuristic used to support decision-making processes. These disciplines could help to explain some of the factors or mental processes that influence the manager's perception of cause-effect relationships and consequently, the choice of financial and non-financial indicators for monitoring purposes.

A well-accepted concept in cognition and judgement and decision-making literatures, the structure of beliefs also called the cognitive or mental model, is believed to influence the individual's perceptions of events and consequently, the choice of information and action [Waller et al., 1995; Walsh, 1995, 1988; Calori et al., 1994; Fiol and Huff, 1992; Barr et al., 1992; Matlin, 1989; O'Keefe and Nadel, 1978]. A mental model is a set of interrelated information, concepts, and cause-effect relationships that provides an individual with an intelligible representation of various situations or environments as he believes the world to be [Walsh, 1995]. According to this concept, an individual can develop a set of mental maps based on his understanding of his environment including his organisational context and tasks performed [Fiol and Huff, 1992]. This

would imply that the content of individuals' mental maps or models could vary as a function of the nature of people's work and organisational environment.

The judgement and decision-making literature suggests that the complexity of managers' organisational contexts and the nature of the tasks they perform may influence the number of cues or cause-effect relationships they select to intelligibly represent those contexts or work processes in their mental models [Calori et al., 1994; Barr et al., 1992; Fiol and Huff, 1992]. For example, using French and British organisations which differ in terms of operations complexity, Calori et al. [1994] found differences among the mental models of twenty-six chief executive officers (CEO). CEOs of organisations in which operations are more complex, for example, diversified and interrelated international operations, tend to develop more complex mental models, that is, including a greater number of cues or cause-effect relationships than CEOs of focused, national, and independent firms. These results suggest that managers who perform complex tasks would tend to perceive a greater number of critical causal relationships (or select a greater number of cues) and develop more complex task-related mental models than others who execute simple tasks.

Calori et al.'s results may also imply that the organisational context or functional areas within which managers work could influence how they perceive the nature of the tasks they perform. Waller et al. [1995], Rosman et al. [1994], and Dearborn and Simon [1958] argue that the managers' perceptions of task-related problems and the selection of cues (or cause-effect relationships) reflect the nature of their organisational and functional contexts. This suggests that the managers' perceptions of the task demand may vary as a function of the complexity of their work environment and, consequently, may influence the

development of the managers' task-related mental models and selection of cues or causal relationships upon which they rely to perform those tasks and to make decisions.²⁴ This line of reasoning leads to the following proposition:

Proposition 10: Managers who execute complex tasks tend to develop more complex task-related mental models than managers who execute simple tasks.

Among other disciplines, research in expert judgement and decision-making in the auditing context provides evidence that education, training, and experience-related knowledge influence the individuals' understanding of their environments and their ability to identify and make accurate judgements on task-related problems [Libby and Frederick, 1990; Bonner, 1990; Libby, 1985; Glaser, 1984]. Libby and Frederick [1990] suggest that experienced auditors identify a greater number of relevant problems and make more accurate judgements than less-experienced auditors. This implies that as individuals gain experience and are exposed to different environments or situations, their mental maps vary over time in terms of complexity (the number of relationships a map contains) and in terms of accuracy or alignment of their maps to reality [Calori et al., 1994; Barr et al., 1992; Matlin, 1989]. Differences among individuals' task-related mental maps in terms of complexity and accuracy could allow some managers to perceive a different number of problems and to make more accurate judgements than others. Consequently, changes in complexity and accuracy of individuals' task-related mental models would lead them to perceive different causal relationships.

²⁴ As discussed in Section 2.3.3, Perrow's taxonomy of task technology which captures the managers' perceptions of their task complexity and diversity could be used to assess the individuals' perceptions of task complexity.

Nisbett and Ross [1980] suggest that individuals become selective over time in their choice of characteristics and the number of elements or features of a stimulus situation that match with their mental models. Although experts appear to identify a greater number of problems, research suggests that as experts become more selective in their information gathering process, they tend to consider a smaller number of critical cues or information in their decision-making process leading to their final evaluation, judgement or decision [Bonner, 1990; Frederick and Libby, 1986; Johnson et al., 1981; Dawes, 1979; Einhorn, 1974; Slovic, 1969]. These results suggest that as individuals gain experience, they also tend to extract or select from their mental models a smaller set of cues or number of cause-effect relationships that appear to be critical to their understanding of their environment and to perform their tasks [Fiol and Huff, 1992; Day and Lord, 1992]. This mental selection process, through which managers may refine their task-related mental model, appears to be similar to the cue selection process studied in judgement and decision-making research [Bonner, 1990; Einhorn, 1974; Slovic, 1969]. These critical cause-effect links are believed to form “selected” or more “refined” and organised managers’ mental models which would include a smaller number of important causal relationships. According to this line of reasoning, the task-related mental models of less-experienced managers would tend to be less refined and less organised and, consequently, include a greater number of cues or cause-effect relationships.

Managers’ experience and their ability to select a smaller number of critical cause-effect relationships from their more complex task-related mental models could also influence the mix of information they use [Fiol and Huff, 1992]. Schroder et al. [1967] suggest that individuals differ in their ability to integrate and combine cues or information

into their decisions. Nisbett and Ross [1982] argue that as individuals' ability to perceive accurately the frequency of events that occur in their environment increases, people tend to use the causal factors disproportionately available to them when they make explanations of events or predictions. This would suggest that managers could simplify or refine their perceptions of their environment or tasks by focusing on a smaller number of causal relationships which they perceive to be accurate and critical for monitoring the organisation's main processes. Consequently, as the managers' selected task-related mental models become more refined (including only a smaller number of critical causal links relevant to the understanding of a situation), managers could tend to rely more on the cause-effect relationships they perceive between events, concepts or constructs.²⁵

Since experienced managers tend to develop more refined task-related mental models, it is possible that those managers may focus on the factors (or organisation's main processes) that they perceive drive the organisation's financial results rather than monitoring directly the effects of those factors or processes. Building on the earlier discussion of measurement theory and the Bruns and McKinnon [1993] anecdotal evidence, experienced managers may tend to use the non-financial indicators that drive the performance of their department or organisation instead of focusing directly on the performance indicators expressed in financial terms. Consequently, as managers gain experience and their selected task-related mental models become more refined, experienced managers would tend to use a greater proportion of non-financial indicators in their mix of information for monitoring purposes.

²⁵ Fiol and Huff [1992, p. 276] suggest that individuals' mental models can highlight priorities or important causal relationships when they face too much information. This would allow managers to process information make decisions or judgements.

Expert judgement and decision-making research suggests that less-experienced managers tend to select more causal relationships to be important in a stimulus situation than experienced managers [Bonner, 1990; Libby and Frederick, 1990; Einhorn, 1974; Slovic, 1969]. It appears that less-experienced individuals follow a data-driven problem identification process due to their inability to recognise and select only the relevant cause-effect relationships from their less refined, less organised, and less accurate task-related mental models [Lord and Maher, 1990]. Consequently, the less-experienced managers' inability to select a smaller number of causal relationships relevant to a situation could lead them to focus on the results (or effects) of the cause-effect relationships rather than to monitor directly the cause itself. According to this line of reasoning, less-experienced managers may tend to focus on the results of the organisation's processes expressed in financial terms. The use of more financial information in their mix of information may also help less-experienced managers to refine their task-related mental models by providing them with a more aggregated view of the organisation's processes performance captured through financial indicators such as profit.

This line of arguments leads to the following propositions:

Proposition 11: Experienced managers tend to select a smaller number of critical causal relationships between non-financial and financial indicators than less-experienced managers.

Proposition 12: Managers who select a smaller number of critical causal relationships between non-financial and financial indicators tend to use a greater proportion of non-financial indicators in their mix of information than managers who select a greater number of less relevant causal relationships.

In summary, experience is believed to influence the level of complexity of managers' selected task-related mental models. Managers with more experience will select a smaller number of critical cause-effect relationships between constructs and their respective surrogates for monitoring purposes than will managers with less experience. As the manager's tasks become more complex, a manager's selected task-related mental model is believed to increase in complexity. Consequently, according to measurement theory, as managers gain experience and tend to select a smaller set of important causal links to describe their tasks and environment, experienced managers tend to use a greater proportion of non-financial than financial information in their mix of information for monitoring purposes.

2.4 SUMMARY

The use of perceptual contextual, organisational, and individual variables in the analysis of their potential effects on the mix of quantitative information managers use could be considered as an innovation in management accounting research. Drawing from different literatures, the model proposed in this thesis attempts to predict the mix of quantitative information managers use.

Based on the contextual and organisational variables, the main predictions of the effects of these variables on the mix of information managers use are as follows.

In general, managers are expected to use a small proportion of financial information (or a large proportion of quantitative non-financial information) in their mix of quantitative information either when they perceive a high level of external environmental uncertainty, make tactical and operational decisions, or their organisation's reward system is perceived to be contingent on non-financial performance measures, or a routine technology, and a Defender strategy type. Alternatively, managers may tend to use a large proportion of quantitative financial information (or a small proportion of quantitative non-financial information) in their mix of quantitative information either when they perceive a low level of external environmental uncertainty, make strategic decisions, or their organisation's reward system is perceived to be contingent on financial performance measures, or a nonroutine technology, and a Prospector strategy type.

However, there is a conflicting prediction based on the actual research evidence. For example, organisations that adopt a Defender strategy type would tend to be more centralised and should use more quantitative non-financial information [Simons, 1987,

1990; Miller and Friesen, 1982]. However, taken individually, managers who perceive both their organisation as centralised and lower levels of perceived environmental uncertainty may tend to use more quantitative financial information [Gul and Chia, 1994]. This may imply that possible omitted variables can act on either group of variables and create this conflicting prediction. To solve this conflicting situation, this thesis relies on individual variables to investigate the effect of the manager's functional experience on his perception of environmental uncertainty and causal relationships which could influence his use of information.

Management research suggests that organisations differ in terms of composition of their management team [Thomas et al. 1991; Norburn and Birley, 1988]. Suggesting more than the existence of self-selection bias, individuals who form the organisation's ranks could influence at different degrees the organisation's information use and the development of information systems by their ability to manipulate information and to perceive their environment and causal relationships [Calori et al., 1994; Fiol and Huff, 1992; Lord and Maher, 1990;]. Therefore, the use of individual variables brings a richer theory-building mode by providing opportunities to disentangle the conflicting evidence that has been gathered to date. Moreover, the development of a model or theory based on the existing bodies of knowledge including perceptual contextual, organisational, and individual variables and its refinement through field studies contributes to the development of theoretical generalisations that may help to direct future research and large-scale theory testing studies on the mix of quantitative information. In summary, this thesis could represent the first step made to clarify the effects of these contextual, organisational, and

individual variables on the mix of quantitative information managers use and could lead to the development of a more integrative theory of information in management accounting.

CHAPTER 3
RESEARCH METHODOLOGY AND
DESCRIPTIVE STATISTICS

3.1 INTRODUCTION

This chapter describes the research methodology, the sampling strategy, and the measurement instruments that this thesis uses to revise the proposed theoretical model and preliminary research propositions. It also provides a brief description of the sample of organisations and managers that participated in this study.

3.2 RESEARCH METHODOLOGY

This thesis employs an exploratory field study research method to revise the theoretical model or conceptual framework developed based on the inferences drawn and the extensions made from the scarce literature on the mix of quantitative information managers use in organisations. The evidence gathered from the exploratory field studies also serves to revise the preliminary research propositions and to develop theoretical generalisations [Yin, 1994; Atkinson, 1990].²⁶ The use of such a research approach conforms with the theory-building objective of this thesis which relies mainly on

²⁶ The “field study” approach includes both the administration of a questionnaire to the managers and their participation in an interview. Throughout this thesis, the references made to the field study evidence implies a combination of the information collected from either sources such as direct observations, archival data, questionnaires, or interviews.

qualitative and quantitative analyses to revise the preliminary research propositions [Miles and Huberman, 1994]. Relying on a multiple within-case approach, a set of six firms that vary in terms of organisational strategy, size, and industry makes up the sample used for the theory-building, revising the research propositions, and making theoretical generalisations.

The motivation for using this research method is that the field study approach is versatile [Merchant et al., 1995]. It allows for the investigation of a phenomenon in an actual and rich organisational context to either describe or explain this phenomenon that is not very well understood, i.e. the exploratory mode [Yin, 1994; Atkinson, 1990]. More specifically, the field study approach allows for the refinement of preliminary research propositions or the development of new propositions emerging from the field work. In other words, the exploratory version of the field study approach provides the flexibility to identify other important variables that could influence the mix of quantitative information [Yin, 1994; Atkinson, 1990].

The explanatory component of the field study, also associated with a theory-driven approach, relies on a set of preliminary research propositions developed based on prior literature to direct the field observations and information gathering toward the revision of those research propositions [Miles and Huberman, 1994; Atkinson, 1990]. This evidence allows for the development of formal research propositions and theoretical generalisations representing the results of the field work. The combination of explanatory and exploratory field work helps to develop an integrative view of the factors that have been

intensively researched and other unanticipated elements that also influence the mix of quantitative information managers use in organisations.

To gather the information required for the revision and development of the formal research propositions, this thesis employs a questionnaire or survey along with semi-structured interviews. Gathering the information through a questionnaire including well-tested measurement scales reduces the length of the interview and provides a broad range of descriptive data and perceptual information that captures, in essence, the variables included in the theoretical model. This method, also used in Manzoni [1994], is efficient and facilitates the field study by eliciting the greatest amount of information in a given period of time.

In addition, interviews conducted according to a pre-determined plan permit the validation of some questionnaire information and also allow the researcher to ask managers open-ended questions to gather information that could not be obtained from a questionnaire. Considering the multiple within-case approach used in this thesis, Miles and Huberman [1994] suggest that the use of a questionnaire and interviews helps to direct in a comparable manner the information gathering in multiple settings and to provide reliable observations and unskewed information due to the use of pre-designed and structured research tools. Moreover, the semi-structured interview process maintains the research flexibility of the field-study inquiry by giving the researcher the opportunity to investigate other important unanticipated factors that could influence the mix of information managers use. Pre-tested using researchers and managers other than those

involved in this study, the questionnaire and the interview plan provide the information required to revise the theoretical model and research propositions developed in this thesis.

3.3 SAMPLING STRATEGY

3.3.1 Firm selection

Field studies were conducted in six organisations located in the Province of Quebec. The sampling strategy used to select those firms relies on three criteria: the organisation's strategy; its size determined by the annual total sales; and its industry membership to provide a balanced design that also creates variance by introducing different sizes of organisations in both the manufacturing and service sectors. Relying on specific and predetermined sampling criteria arranged into a sampling matrix allowed the researcher to select only the organisations that met those criteria and, consequently, to avoid the use of a convenience sample of firms which could have compromised the external validity of this study.

Determining the number of organisations or sites required for this thesis implies trade-offs between internal and external validity. Increasing the number of organisations helps to better understand the factors or circumstances that influence the mix of information managers use and consequently, provides a better ground for making generalisations of the field study results, which supports external validity. Alternatively, time constraints often interfere with field-work by reducing the number of managers who participate in this research at each organisation. This threatens the internal validity by decreasing the depth of the analysis at each site and limiting the ability of the researcher to

corroborate information among interviewees and sites. In trying to maintain a reasonable balance between external and internal validity, this thesis relied on the Cook and Campbell [1979] “deliberate sampling for heterogeneity” approach (i.e., external validity oriented) and used a sample of six organisations which supported making theoretical generalisations to specific target populations of firms or persons. By contrasting two types of organisations, Defender and Prospector, each including a small, a medium, and a large-sized organisations from diverse industries, this thesis used a similar sample size as in prior studies (see Armitage and Atkinson, 1990; Fisher, 1992; Manzoni, 1994; Merchant et al., 1995).

Using the 3 sampling criteria, potential firms were identified through press clippings or personal contacts. To secure the participation of six organisations in this study, 19 firms were contacted to verify they met the attributes assumed in the sampling strategy. Most contacts were made through the head of the finance department. To determine the firm selection in the sample, the organisation contact was asked to classify his organisation as a Defender or Prospector according to the Shortell and Zajac [1990] self-typing instrument and to provide the annual total sales along with other information required to categorise the organisation according to its size and to verify the manager’s classification of the firm’s strategy (See Thomas et al. [1991] for the details).

The organisation contact was asked to allow managers from the strategic, tactical, and operational level of decisions in the marketing-sales, production-operations, and human resources functional areas to participate in the study. The organisation contact was also asked to send an information letter to those managers inviting them to participate in

this study. Following this sampling strategy meant that nine managers could be asked to participate in this study. However, not all organisations had a manager making decisions at each of the specific decision levels and not all organisations had a human resources department especially in medium and small-sized organisations. This reduced the potential number of managers that could participate in this research. Given the model-building mode of this thesis, the heterogeneity of the organisations selected (i.e. large, medium, and small-sized organisations) and the richness of their environments were considered more important than the absolute number of managers that could participate in the study. Consequently, a number of managers ranging from five to nine were selected in each organisation to participate in this study leading to a total of 42 participants.

The organisation contact was assured of the confidentiality of the data gathered about the organisation and from each of the participants. Managers were also told that they would receive a summary report including the main results of this study conducted in five other organisations in a format that would protect the confidentiality of the organisations and participants after the data analysis was completed. The president or the organisation contact was also told they would receive a summary of the findings in his organisation, a summary that was designed to preserve the confidentiality of the information provided by each manager.

3.3.2 Data collection process

During a meeting held two weeks before the beginning of the field work, the organisation contact and managers from the marketing-sales, production-operations, and human resources departments willing to participate in the study received a copy of the questionnaire (See the English and French versions in Appendix A). Each group of questions included in this pre-tested questionnaire were drawn from well-tested and reliable instruments and were explained to the managers. To accommodate the language preference of the managers involved in this study, the instruments were translated in French and reviewed by two bilingual researchers to assure their equivalence. During this meeting, the purpose of this research was disclosed and the managers were told that this study was not directed toward a specific “pet theory” and that there was no right or wrong answer to the questions. Managers were also told that their participation was very important for the success of this study and that any information they would provide would be kept strictly confidential. In general, 75 minutes were required from managers to complete this questionnaire.

Participants were also told that it would be helpful if they could answer as many questions as possible in order to support a richer data analysis. Each manager was also told that the agreement to participate in this study also implied his participation in an interview that would last between 30 to 75 minutes. It was mentioned to the managers that their participation in the interview was essential to corroborate some information contained in the questionnaire and to more deeply explore some of the issues addressed in the questionnaire. At the end of this meeting, an interview schedule was developed and

managers were told that the questionnaire would be either collected at the time of the interview or could be sent to the organisation contact in a sealed envelope provided by the researcher. Managers were also told that they could contact the researcher to obtain any information they felt useful to complete the questionnaire.

The interview time and place was confirmed with each of the managers two days before the pre-scheduled time. Press clipping and information about the organisation's industry was gathered before the interview to develop a better understanding of the firm's characteristics. Before the interview, the questionnaire was collected and scanned to obtain the profile of the manager. In situations where information was missing, the manager was asked the reasons why he did not provide some of the information required. In general, most of the questionnaires were well completed.

The interview was conducted in French to accommodate the language preference of the managers involved in this study according to an interview plan (See the English and French version in Appendix B). Again, at the beginning of the interview, each manager was reminded that this research has no "pet theory" and that there was no right or wrong answer to the questions. Although the interview plan was developed to provide uniformity in conducting the interviews, the interview process remained semi-structured in allowing interesting answers to be asked or reluctance to provide information to be targeted and thoroughly investigated for more details. The participants were also told at the beginning of the interview to indicate whether they felt that they were being led toward a particular position or if their answers were being restricted in any way. This approach helped to avoid potential threats to interview validity, i.e. demand effect,

evaluation apprehension, and the research expectancy effect [Manzoni, 1994]. The answers and relevant comments managers provided during the interview were carefully noted and restated to them in order to ensure that the content conformed with their responses.²⁷

During the interview, details and illustrations were gathered to help control for the phenomenon of interviewees portraying themselves in a better light. As part of the triangulation methods used to control for this behaviour, interviewees were asked to show examples of reports they used. Moreover, their responses were compared with the information obtained from their superiors during the interview. There was no evidence suggesting that the interviewees portrayed themselves in a way that would invalidate the interpretations drawn from their responses.

At the end of the interview, each participant was asked to complete a pre-tested instrument that captured the manager's perception of causal relationships among concepts (See the English and French versions in Appendix C). After having explained the content of this instrument to the managers, they were allocated a maximum of five minutes to complete it. They were reassured that there was no right or wrong number of causal relationships and that this instrument had no other hidden purpose or objective than the one mentioned to them (See Appendix B for the details of the instructions read to each manager). All managers completed this instrument in the allocated time and were also given the opportunity to ask any other questions they could have about the study, after

²⁷ Merchant et al. [1995] use a similar approach during the interview process.

which each manager was thanked for his participation. Each day, an English summary of each interview was developed to support further data analyses.

3.4 DESCRIPTION OF THE SAMPLE

The application of the sampling strategy led to the selection of six organisations from the population of firms that were located and had their Headquarters in the Province of Quebec. Three of these six firms, each operating in different sectors of the economy, were multi-divisional organisations that were heavily involved in selling both within Canada and internationally. Two other organisations sold their products or services in other Provinces. Only one organisation operated exclusively in the Province of Quebec. These organisations were spread throughout the province. The annual total sales for these organisations ranged from 2 million to 200 million dollars with an average of 95 million and a median of 102 million dollars. The number of employees varied from 125 to 1 300 with an average of 600 employees and a median 450 employees. Considering the time constraints, only one business unit located in the Province of Quebec considered as representative of each organisation was selected to conduct this research. There was no reason to believe that this sample did not conform with the characteristics of the population of organisations that operate in the Province of Quebec which greatly depend on commercial exchanges with the other Canadian Provinces and countries.

Table 5 provides a classification of the firms in terms of their size, industry membership, and strategy. It also includes the breakdown of the extent of participation of the 42 managers who participated in this study and invested a total of 102 hours of their

time in this research. Based on the agreement of information confidentiality, each organisation is labelled with a letter of the alphabet.

Table 5

Firms' classification and summary of interviews conducted at six sites

Organisation	Industry	Size	Organisational strategy	Number of interviews	Hours of Interview	Hours to complete the questionnaire	Total hours required from managers
A	Manufacturing of basic products (food, textile, paper, chemical)	Large	Defender	7	7.00	8.75	15.75
B	Natural resources	Medium	Defender	9	10.25	11.25	21.50
C	Services	Small	Defender	7	8.50	8.75	17.25
D	Manufacturing of basic products (food, textile, paper, chemical)	Large	Prospector	8	7.50	10.00	17.50
E	Services	Medium	Prospector	5	7.00	6.25	13.25
F	Manufacturing of basic products (food, textile, paper, chemical)	Small	Prospector	6	9.25	7.50	16.75
				<u>42</u>	<u>49.50</u>	<u>52.50</u>	<u>102.00</u>

Organisation A, B, and C were classified by their managers as Defenders and are respectively large, medium, and small-sized firms. Organisation A and B are specialised respectively in the food processing and in the natural resources (wood products) industries. Organisation C is specialised in the recreation industry. A total of 23 managers from those Defender organisations completed the questionnaire and participated in the interview for a total of 55 hours invested in this study.

Alternatively, Organisation D, E, and F were selected as large, medium, and small sized firms and classified as Prospectors. Organisation D and F are specialised respectively in the beverages and textile (garment) industries. Organisation E operates in the transportation industry. A total of 19 managers in those Prospector organisations agreed to participate in this study and allocated a total of 47 hours in completing the questionnaire and taking part in the interview.

The application of the sampling strategy used in this research resulted in the participation of at least one manager from each decision level in all functional areas in each category of organisation strategy, i.e. Defender and Prospector. As mentioned in Section 2.3.2, managers were classified into different levels of decisions according to the hierarchical position they occupied in the organisation. For example, presidents, vice-presidents, assistant vice-presidents and general managers were classified as strategic managers. Plant, divisional, and functional directors were classified as tactical managers. Finally, superintendents, supervisors, and factory-floor managers were classified as operational managers. The results of this classification were then compared to the examples of the main type of decisions managers made that was gathered during the interview. This classification method commonly used in the management literature seems

to conform with Anthony's taxonomy (e.g. Daft et al., 1988; Norburn and Birley, 1988; Thomas et al., 1991). Panel A and B of Table 6 provide the interview breakdown of managers by functional areas, decision levels, and strategies.

Table 6
Interview breakdown

Panel A: Interview breakdown by functional areas and decision levels

<u>Decision level</u>	Production -operations	Marketing - sales	Human Resources	Total
Strategic	9	7	4	20
Tactical	6	4	4	14
Operational	4	2	2	8
	<u>19</u>	<u>13</u>	<u>10</u>	<u>42</u>

Panel B: Interview breakdown by organisational strategy, functional areas, and decision levels

<u>Decision level</u>	Defender			Prospector			Total
	Production -operations	Marketing - sales	Human Resources	Production -operations	Marketing - sales	Human Resources	
Strategic	5	3	2	4	2	2	20
Tactical	3	2	3	3	2	1	14
Operational	3	1	1	1	1	1	8
Total	<u>11</u>	<u>6</u>	<u>6</u>	<u>8</u>	<u>7</u>	<u>4</u>	<u>42</u>

Panel A shows that a total of 20, 14, and 8 managers were sampled respectively at the strategic, tactical, and operational level of decisions in the whole sample. Managers from the production-operations, marketing-sales, and human resources areas are represented respectively by 19, 13, and 10 managers in the study. Panel B provides the breakdown of the number of managers participating in the study by organisational strategy. In general, at least one manager per functional area and level of decision in each group of Defender and Prospector organisations participated in the study. Panel B also illustrates the similarity in terms of number of managers sampled in Defenders and Prospectors for each level of decisions. This balanced sample in terms of organisations' characteristics and managers' functional membership and levels of decisions allowed for unbiased theoretical generalisations of the field study findings to similar settings.

3.5 QUANTITATIVE DATA COLLECTED

The questionnaire included a series of items used to capture the richness of the mix of information managers used and to assess their perceptions of the task-technology used, the level of centralisation of their organisation, the performance measures used in the reward systems, the organisation's strategy, and the organisation's environmental uncertainty. It also provided descriptive information of the manager's education, experience, tenure in their current and prior functional positions, and age. The instruments required to capture those constructs were drawn from prior research (See Appendix A for the details of the instruments). A description of those instruments, the

reliability indices, tests of normality, and descriptive statistics are included in the following section.²⁸

3.5.1 The mix of quantitative information managers use

A list including 77 pieces of quantitative information was developed in order to capture the richness of the mix of information managers used on a daily, weekly, monthly, quarterly, and yearly basis.²⁹ A single index instrument was developed based on the studies of Armitage and Atkinson [1990], Abernethy and Lillis [1995], and from my own experience as an auditor and a financial controller in a large manufacturing organisation.³⁰ This index included a broader range of financial and non-financial indicators which could be available in the organisation or through managers' personal sources of information. This approach relies on the assumption that the mix of information managers use is uni-dimensional and can vary from being entirely composed of quantitative non-financial information to being entirely composed of quantitative financial information [Campbell, 1994].³¹ Drawing from examples of standard financial statements, management reports,

²⁸ If the test of the assumption of the normality of the distribution of the data gathered in this study is satisfied then one can rely on statistical techniques that are commonly used in research such as t-test or analysis of variance, i.e. parametric tests, which assume such a distribution. Considering that this study uses a sample of 42 managers, and that a sample size greater than 30 observations tends to follow a normal distribution, the non-rejection of the assumption of normality supports the use of such parametric tests.

²⁹ The list is included in Appendix A.

³⁰ To facilitate the completion of Question 3 of the questionnaire, the performance measures were grouped into functional sections such as marketing-sales (items 1 to 24), inventories (items 25 to 27), production and human resources (items 28 to 44, 47, 49, 50), and general financial information (items 45, 46, 48, 51-70). Except for the general financial information section, all other sections included both financial and non-financial indicators. Since managers did identify both financial and non-financial indicators when completing the questionnaire, this reduces the possibility that the grouping of items into functional categories may have influenced managers' responses. In addition, since the questionnaire included 38 financial and 39 non-financial performance indicators, this also ruled out some possible biases related to the use of unbalanced instruments.

³¹ The discussions with managers during the interviews suggested that they tend to perceive the concept of the mix of quantitative information as uni-dimensional ranging on a continuum from non-financial to financial. This suggests

and industry publications, the single index instrument is believed to reflect the effects of the organisation's internal and external reporting, the managers' personal sources of information, and the nature of the organisation's information systems on the nature of the mix of information managers may use in the organisation.

The use of a relative measure or single index to capture the composition of the manager's mix of information allows for a cross-sectional comparison of all managers. For example, a large sized organisation which may have a greater number of information systems could provide managers with a greater number of indicators compared to a much smaller organisation. Since the main purpose of this dissertation is to study the proportion of financial and non-financial information managers use without any attempt to differentiate between the number or the usefulness of indicators of the same nature, i.e., financial or non-financial, the use of a relative measure is perceived to be more appropriate. This index could also help to avoid comparison problems among organisations as mentioned above. A similar measure expressed as a percentage was used by Whittington and Margheim [1993]. Moreover since the only studies available to compare the results of this dissertation used relative measures of the mix of information expressed as a percentage, (See Nanni et al., 1990), the same approach was also adopted here instead of relying on the raw number of performance measures.³² The higher the percentage, the more quantitative non-financial information the manager uses. For each

that the measure of the manager's mix of quantitative information expressed as a percentage conforms to the unidimensionality of the mix concept.

³² Moreover, the raw number of performance indicators managers used was also not normally distributed and, therefore, would have caused problems in the statistical analyses conducted in Chapter 4. The potential statistical problems with the use of raw number of performance indicators were ruled out with the use of the information mix expressed as a percentage.

time frame, the mix of quantitative information used by the manager was computed based on the following expressions:

$$\text{Percentage (\%)} \text{ of NF used} = \frac{\text{Number of NF used}}{\text{Number of NF used} + \text{Number of F used}}$$

$$\text{Percentage (\%)} \text{ of F used} = 100 \% - \text{Percentage of NF used}$$

The manager was also asked to rank on a 5 item scale, (1: the most important, 5: the least important), the five performance measures he used on a daily, weekly, monthly, quarterly and yearly basis that he considered the most important. Each of the five most important performance measures will be equally weighted to determine the nature of the manager's performance focus. A similar approach was used in Abernethy and Lillis [1995]. It is suggested that an equally weighted approach is as good as unequally weighted items [Dawes, 1979]. The attribution of equal weight to each item avoids the subjectivity relating to the managers' weight assessment. In short, the effect of managers' selective memory could influence them to recall more of some performance measures recently used over others due to the availability heuristic [Dawes, 1979; Johnson et al., 1981]. Moreover, Einhorn [1974] suggests that individuals tend to overvalue or undervalue particular information cues or attributes due to a "halo effect". This would imply that managers could make a general judgement about the information they use and then work at justifying through the weighting process their general impression each of the most important indicators they use. This could introduce noise in the analyses conducted on the mix of information managers use.

In contrast, other studies rely on unequally weighted item instruments because they suggest that individuals may differ in the weight they give to similar information cues or

performance indicators [Bonner 1990; Johnson et al., 1981]. However, it is unclear whether the level of individual's experience or the individual's task-specific related knowledge create differences with regard to cue weighting [Bonner, 1990]. Considering the exploratory nature of this dissertation and the potential impacts of this unsettling evidence of individual differences on cue weighting, it was decided to use an equally weighted cue approach. This method, which gives an equal weight to each of the five most important performance indicators, may also provide a more systematic way to reduce the effects of potential individual omitted variables on cue weighting.

However, the information gathered on the five most important indicators in the questionnaire which could have been analysed with the equally weighted approach was not used because this question was not consistently answered even though a similar approach was used in prior studies (See Abernethy and Lillis, 1995). Further, blank space was provided on the list to allow the managers to identify other quantitative financial (F) and quantitative non-financial (NF) measures that are available and used, but that were not included on the list. Only 17 managers identified, on average, 4 additional measures (2 financial and 2 non-financial indicators) that were not included in the list.³³

In general, the mix of information managers used for monitoring purposes varied across the time horizons. In short, production-operations managers used a greater proportion of non-financial indicators in their mix of information than marketing-sales and human resources managers. Their mix of information was composed on average of 70 %

³³ Since this thesis focuses only on the mix of information expressed as a percentage (a relative measure of the mix of information managers use), in the few exceptions where additional indicators were provided, they were classified into financial or non-financial information and included in the calculation of the mix of information according to the formula described in this section.

of non-financial information across the time horizons. The mix of information of marketing-sales managers was composed on average of 36 % of non-financial information across the time horizons. Human resources managers used a mix of information that contained on average 61 % of non-financial information. The Kolmogorov-Smirnov test of normality suggests that the mixes of information managers used on a daily, weekly, monthly, quarterly, and yearly basis followed a normal distribution.

3.5.2 The perceived external environmental uncertainty (PEU)

Based on a Likert 7 item instrument, the Miles and Snow [1978] twenty-five questions divided into six sub-scales captured the level of perceived environmental uncertainty strategic, tactical, and operational managers perceived in their external environment. The sub-scales correspond to the six key sectors of the external environment of organisations (suppliers, competitors, customers, financial markets, government and regulatory agencies, and unions) and can be summed to obtain an overall score for Milliken's concept of perceived external environmental uncertainty leading to a more global and well-defined measure of the construct domain rather than its individual sub-scale measurements [Buchko, 1994; Crocker and Algina, 1986].³⁴ For this reason, no analyses will be conducted on each of the PEU individual sub-scales. The internal reliability for the sub-scales used was, on average, satisfactory according to Nunnally [1978] (Cronbach alpha ≥ 0.70).³⁵ The Cronbach alpha was, on average, 0.71.

³⁴ Buchko [1994] argues that the Miles and Snow instrument has a fairly strong reliability to capture the concept of perceived external environmental uncertainty described by Milliken [1987].

³⁵ The Cronbach alpha is a measure of the degree to which the items or questions on a scale constitute a good indicator of the underlying construct of interest. According to Crocker and Algina, the minimum acceptable value

Considering that all managers were administered the same instrument, some of the items on the scale were not applicable to all of them, or they chose not to answer all the questions. The small number of managers from the production-operation, marketing-sales, and human resources who participated in this study and who provided answers to the questions for only some of the six sub-scales made it impossible to compare managers' answers among the sub-scales. In order to solve this problem and to obtain a continuous and normally distributed variable, all managers' scores were transformed into a percentage.³⁶ According to this conversion rule, the manager's score ranged from 25 % to 72.3 % with an average of 45 %, a median of 44.6 %, and a standard deviation of 9.8%. The Kolmogorov-Smirnov test of normality suggests that the perceived environmental uncertainty expressed as a percentage followed a normal distribution.

3.5.3 The level of organisational centralisation (Central)

Based on a scale from 1 to 5, the Aston fourteen item instrument, also used in Mangaliso [1995], provided the manager's perceived level of centralisation of the organisational structure in this study. With a Cronbach alpha of 0.89, its reliability was considered satisfactory. The Kolmogorov-Smirnov test of normality suggests that the manager's perception of organisational centralisation was normally distributed. In general, the managers' perceived level of centralisation varied from 21 to 63 with an average of 42.7, a median of 44.3, and a standard deviation of 10.3. Categorized respectively in

of this measure is 0.60. According to Nunnally [1978], a satisfactory level is considered to be greater or equal to 0.70.

³⁶ The rule used to transform the manager's score on the Miles and Snow's instrument is as follows: the total score obtained on the Likert 7 item scale divided by the product of the number of items answered times 7.

terms of decentralised and centralised organisations based on a split at the cutting value of 35 of the manager's score on this instrument, the highest frequency (a proportion of managers with a similar perception, i.e. centralised or decentralised, greater than 50 %) of organisational type for each firm provided a clear pattern of organisational structure.³⁷ According to this categorisation rule and only for descriptive purposes, the organisations A, B, D, and F were perceived as centralised and the organisations C and E were considered decentralised by their managers.

3.5.4 The nature of the task-technology (Task)

Six items included in the Withey et al. [1983] combined instrument measured on a Likert 7 item scale provided a classification of the nature of the task-technology each manager used in the organisation. With a Cronbach Alpha of 0.80, the reliability of this instrument was considered satisfactory. The Kolmogorov-Smirnov test of normality suggests that the managers' scores on the task-technology scale followed a normal distribution. Based on this scale, the manager's score ranged from 8 to 33 with an average of 22, a median of 22, and a standard deviation of 6.1. Using the individual's total score on this instrument, the manager's perception of their task-technology was respectively classified between nonroutine and routine technology at the cutting value of

³⁷ The conceptual cutting value (cut-off score) represents the mid point of this instrument that discriminates between two conceptual domains, i.e., managers who perceived their organisation as being decentralised (lower score) from the ones who perceived their organisation as centralised (higher score) [See Crocker and Algina, 1986]. On the fourteen item instrument using a scale from 1 to 5, the value of 35 represents the cutting point that separates conceptually the managers' perceptions into two groups (decentralised vs centralised) according to the following expression:

$$\text{Cutting point} = [14 \text{ questions} \times 5 \text{ (i.e., maximum on the scale)}] / 2.$$

21.³⁸ According to this rule, 19 managers perceived their task-technology as a routine, and 23 managers as a nonroutine.

3.5.5 The nature of the reward systems (Perform)

A seven item Likert-type instrument was developed to capture the manager's perception of the nature of the performance indicators used to assess and reward his performance inspired from the Cammann [1976] questionnaire. A factor analysis revealed three main factors. Items 2, 3, and 4 corresponding to financial indicators and financial rewards mainly loaded on one of the factors that was called financial performance.³⁹ With an acceptable Cronbach alpha of 0.63, these three items were used to analyse the manager's perception of the indicators used to assess and reward his performance.⁴⁰ The Kolmogorov-Smirnov test of normality suggests that the managers' scores on this reduced scale followed a normal distribution. The other items were ignored in the analysis due to their low level of reliability. The manager's score on this reduced financial performance scale varied from 5 to 21 with an average of 13.3, a median of 13, and a standard deviation of 4.1. The mean suggests that managers perceived their performance

³⁸ The conceptual cutting value (cut-off score) represents the mid point of this instrument that discriminates between two conceptual domains, i.e., managers who perceived their work as nonroutine (lower score) from the ones who perceived their work as routine (higher score) [See Crocker and Algina, 1986]. On the six item instrument using a Likert 7 item scale, the value of 21 represents the cutting point that separates conceptually the managers' perceptions into two groups (routine vs nonroutine) according to the following expression:

$$\text{Cutting point} = [6 \text{ questions} \times 7 \text{ (i.e., maximum on the scale)}] / 2.$$

³⁹ A factor analysis is a statistical technique that allows the identification of a set of variables or questions on a scale that are correlated with one another but largely independent of other subsets of variables or questions on the same scale [Tabachnick and Fidell, 1989]. The set of correlated variables or questions that are independent of other subsets are combined into a "factor". For example, task-variety and task-analysability, which form the concept of Perrow's task-technology, represent two factors or sets of combined correlated questions that are largely independent of one another (See Withey et al. [1983] for the details).

⁴⁰ According to Crocker and Algina [1986], the minimum acceptable value of this measure is 0.60.

assessment and reward as related to a greater extent to financial indicators such as cost or profit than to any other type of non-financial measures or qualitative factors.

Managers were also asked to identify the five most important performance measures they perceive their superiors use to assess and reward their performance. An equally weighted approach was used to identify the manager's perceived focus on either financial or non-financial performance-reward information. The same reasons mentioned in Section 3.5.1 about the managers' mix of information justify the use of equally weighted items. The results of the analysis conducted on the five most important performance-reward measures are reported in Section 4.3.5 of this dissertation.

3.5.6 The organisation's strategy (Organ)

A mix of classification methods, i.e. the self-typing by the managers, the use of objective indicators, and researcher inference was used to categorise the organisation's strategy according to the Zahra and Pearce II [1990] recommendation to increase the validity of the strategy classification. The Shortell and Zajac [1990] self-typing instrument was used to classify the organisation's strategy. The strategy with the highest frequency (a proportion of managers with a similar perception, i.e. Defender or Prospector, greater than 50 %) among the managers' answers was chosen for each of the organisations.

Five objective indicators: the ratio of marketing expenditures to total sales; the ratio of research and development expenditures to total sales; the ratio of net sales per employee; the total number of product lines; and, the number of new products were used

to validate the organisation's strategy classification. The Thomas et al. [1991] classification rule was used to categorise organisations according to their strategy. That is, Prospectors scored higher on the ratios of marketing expenditures, research and development expenditures, total number of product lines, and the number of new products; and lower on the ratio of net sales per employee than Defenders. The researcher inference, which relied on the classification of the organisation's strategy according to Miles and Snow's criteria, was also used as a third method to validate the strategy categorisation. In all cases, the three classification methods produced the same categorisation results. See Table 5 for the final organisation's strategy classification.

3.5.7 The manager's perceived causal relationships (Causal)

An approximate measure of the manager's perception of causal relationship between concepts, which was derived from prior research in cognitive mapping, was used to infer his perception of causal relationships between performance indicators [Calori et al., 1994; Barr et al., 1992; Walsh, 1988]. Described in Appendix C, this instrument captured what is believed to correspond to the manager's perception of causal relationships. A measure of intensity of causality perceptions was also developed as follows:

$$\text{Intensity of perceived causal relationships} = \frac{\text{Number of links from the non - financial concepts to the financial performance of the organisation}}{\text{Total number of links identified between concepts}}$$

This instrument suggests that managers varied in terms of the number of causal relationships they perceived between concepts and in terms of intensity of perceived causal relationships. The Kolmogorov-Smirnov test of normality suggests that the intensity of perceived causal relationships and the total number of links between financial and non-financial concepts and indicators followed a normal distribution. According to this instrument, the number of causal relationships managers perceived between concepts ranged from 7 to 31 with an average of 13.1, a median of 12, and a standard deviation of 5.4 causal links. Their perception of causal intensity, expressed as a percentage, varied from 0 % to 76.2 % with an average of 47.1 %, a median of 46.9 %, and a standard deviation of 14.5%. The number of causal relationships they perceived between non-financial and financial indicators ranged from 0 to 16 with an average of 6.1, a median of 6.0, and a standard deviation of 2.9 causal relationships.

Table 7 presents a summary of the coefficients of reliability of the scales used in this thesis and also provides the Pearson product-moment correlation and Spearman rank-order correlation coefficients.

Table 7

Summary of correlation and reliability coefficients ¹

	PEU	Central	Task	Reward	Causal
PEU	0.75	0.02	0.00	0.05	0.23
Central	-0.07	0.75	-0.35 **	0.22	0.37 **
Task	0.14	-0.34 ***	0.75	-0.08	-0.31 **
Reward	0.09	0.19	-0.10	0.75	0.01
Causal	0.07	0.38 **	-0.21	0.01	0.75

¹ Both the Pearson product-moment correlation coefficients and the Spearman rank-order correlation coefficients are provided in this table. The Pearson product-moment correlation coefficients are presented above the main diagonal. The Spearman rank-order correlation coefficients are presented below the main diagonal. The coefficient of reliability of the scales used in this thesis, the Cronbach alphas, appear on the main diagonal.

- Significance levels (one-tailed): ***<0.01, **<0.05, *<0.10.

Table 7 shows that only three variables are significantly correlated at a probability level of less than 0.05. The managers' perception of task-technology is negatively correlated with their perception of level of organisational centralisation ($r=-0.35$, $p<0.05$). This suggests that managers who perceived their work as nonroutine tended to perceive their organisation as centralised.⁴¹ Moreover, managers who perceived a high level of intensity of causal relationships between financial and non-financial indicators tended to perceive

⁴¹ The organisational literature, which relies on the organisational level of analysis (aggregation of individuals' responses into an organisational measure), suggests the opposite relationship between task-technology and centralisation [For example, Aiken and Hage, 1969; Glisson, 1978]. Considering the small sample size used in this thesis (6 organisations and 42 managers), only analyses at the individual level were conducted in Chapter 4 on the data collected. Since no aggregation of results was performed in this thesis other than for the purpose of this section because of the small sample size used, no comparison can be made with the findings reported in this literature.

their organisation as centralised ($r=0.37$, $p<0.05$). Finally, managers who perceived a high level of intensity of causal relationships between financial and non-financial indicators tended to perceive their work as nonroutine ($r=0.31$, $p<0.05$). These results are discussed further in Chapter 4.

3.5.8 Managers' characteristics

The demographic and descriptive statistics about the managers' level of education, experience, tenure in the current functional position, gender and their age provide interesting information about the manager's characteristics. Table 8 illustrates the attributes of the managers who participated in the study.

Table 8

Demographic statistics

	Mean	Median	Lowest Value	Highest value	Standard Deviation
<u>Panel A: Demographic statistics</u>					
Age	40	44	25	65	9
Years of education	16.6	17	12	20	2.2
Years of work experience	17.3	16	4	37	7.7
Years of company tenure	9.7	8.5	1	32	7.8
Years in current functional position	4.9	4	1	20	4.4

Panel B: School specialisation and highest degree obtained

Specialisation	Number of managers	Degree	Number of managers
General	5		
Technical, mechanical	2	High school	3
Social sciences	1	College	3
Accounting, finance, economics	11	University certificate	7
Marketing, business, public and industrial relations	13	Bachelor's degree	24
Engineering and sciences	10	Master's degree and MBA	5
	<u>42</u>		<u>42</u>

Panel C: Managers' gender

Female	3
Male	39
	<u>42</u>

Managers' age ranged from 25 to 65 years old with a mean of 40 years. They have obtained, on average, a bachelor's degree and had 17 years of experience. They have been, on average, with their current organisation for the last 10 years and had 5 years of experience in their current functional position. The Kolmogorov-Smirnov test of normality suggests that managers' experience followed a normal distribution. Managers are mainly distributed between three groups of school specialisation, i.e. accounting, finance, economics; marketing, business, public and industrial relations; and engineering and sciences. The sample included 3 women and 39 men. These descriptive statistics reflect the main characteristics of the sample of managers drawn from 6 organisations that participated in this study and should be taken into account in interpreting the results of the analyses reported in Chapter 4. Except for the gender characteristics, the sample of managers does not appear to suffer from important biases toward specific individual characteristics which could indicate the possibility of an abnormal pattern of distribution of the managers who participated in this study.

3.6 CONCLUSION

This research design and the use of instruments extensively used in prior studies provided an important volume of qualitative and quantitative information about the factors that influence the mix of quantitative information managers use. This information is used to revise the theoretical model and research propositions developed earlier in this thesis. It also supports the development of theoretical generalisations. The normal distribution of the quantitative information gathered through the questionnaire supports quantitative

analyses that, in turn, supports the qualitative evidence that represented the main element of this thesis.

The next chapter provides the results of the quantitative and qualitative analyses of the information gathered through the field studies. First, quantitative analyses are conducted on the information collected through the questionnaire. A regression model is conducted on the independent variables preliminarily reviewed including the managers' functional areas, an additional independent variable, that was identified during the field studies as a potential determinant of the mix of information managers use in organisations. Even though there are limitations such as a low statistical power imposed on this type of analysis due to the use of a small sample size, the exploratory nature of this thesis along with its theory-building mode justified its use since no statistical generalisations are attempted in this study. The results of this analysis supplement other quantitative and qualitative evidence that are used to revise the preliminary model and propositions and support the development of theoretical generalisations.

In a second stage, the qualitative evidence composed mainly of characteristics and examples of the performance indicators and managers' comments collected during the interviews are brought into the analysis to allow for triangulation of the quantitative evidence and to identify patterns. These results are presented along with the quantitative analyses including mean differences, Chi-squares, etc. to provide the more global evidence required for the revision of the propositions and to support the development of theoretical generalisations. Used in Manzoni [1994], this approach of reporting a combination of quantitative and qualitative evidence was chosen because it is versatile and allows for the

comparison of the results of statistical analyses with the description of actual and rich organisational phenomena leading to the development of a theory. Finally, Chapter 4 concludes with a summary of the qualitative and quantitative support found for the preliminary propositions developed in Chapter 2.

CHAPTER 4

FIELD RESULTS AND DISCUSSION

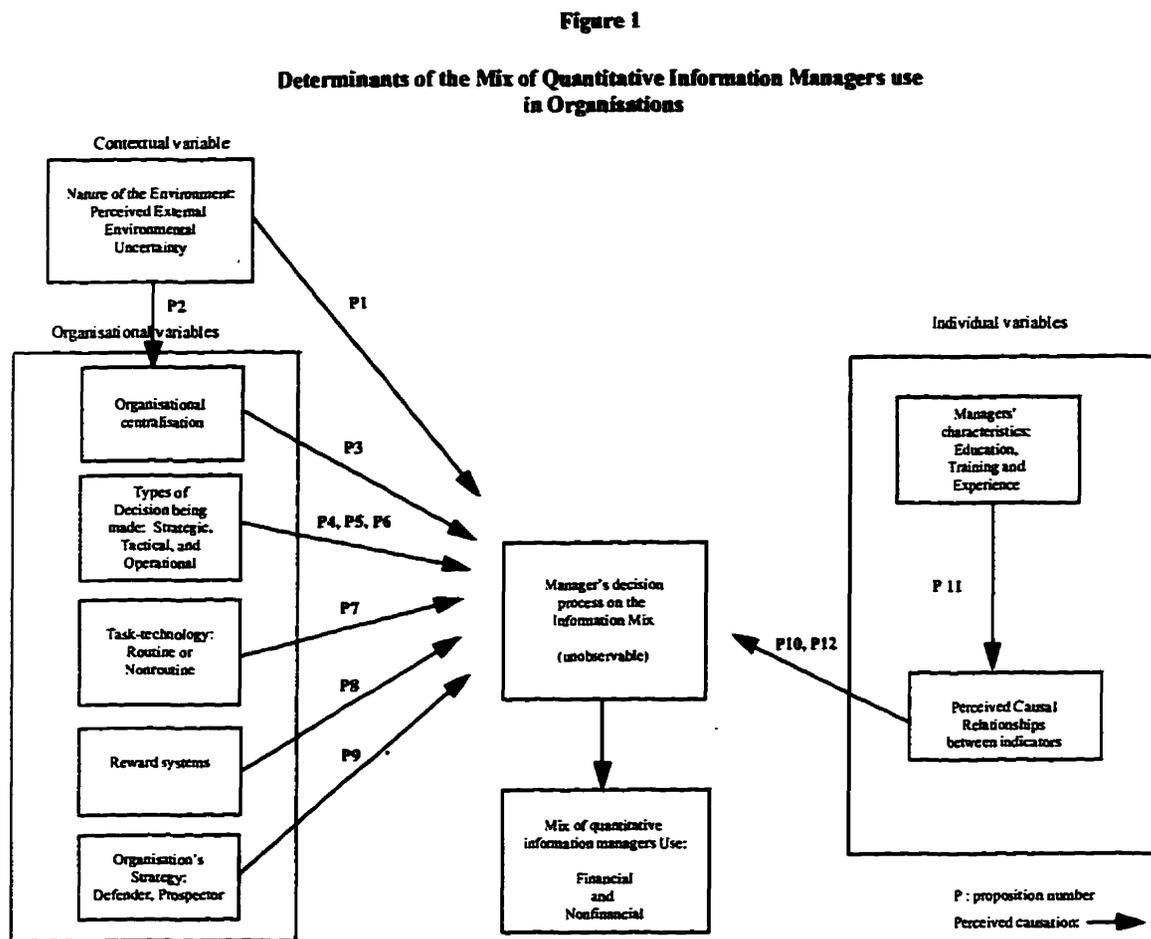
4.1 INTRODUCTION

This chapter presents the results of the qualitative analyses supplemented by quantitative analyses of the information gathered through the field studies for each of the research propositions developed in Chapter 2. It provides a discussion of the exploratory results and draws comparisons with current research to put into perspective the evidence collected during these field studies. It also presents the results' implications for management accounting research and practice.

This chapter is organised as follows. Section 4.2 describes a regression model that includes the determinants of mix of information managers use and reports the results of the preliminary quantitative examination of the related propositions developed in Chapter 2. The regression model also includes the managers' functional areas, a potential determinant of the managers' information menu that emerged during the field studies. Section 4.3 examines the qualitative and other quantitative evidence for each of the variables previously reviewed including the additional variable, the managers' functional areas, identified during the field studies. Section 4.3.1 discusses the effects of the

managers' functional areas on the mix of information they use for monitoring purposes.

Figure 1 is also used as the framework to report the balance of the field study results.



Section 4.3.2 presents the findings related to Propositions 1, 2, and 3 involving managers' perceived external environmental uncertainty and organisational centralisation and their effects on the mix of information managers use. Section 4.3.3 discusses the evidence related to Propositions 4, 5, and 6 concerning the effects of managers' hierarchical position on their mix of information. Section 4.3.4 discusses Proposition 7 which

concerns the impact of the managers' perception of task-technology on their mix of information. Section 4.3.5 presents the evidence gathered on Proposition 8 which argued that managers' perception of the performance indicators their superiors use to reward their performance would influence their mix of information. Section 4.3.6 reports the findings related to Proposition 9 and the effects of managers' organisational membership in Defender and Prospector firms on the mix of information managers use. Section 4.3.7 reports the results on the effect of managers' experience and their perception of causal relationships on the mix of information they use for monitoring purposes as argued in Proposition 10, 11, and 12. Section 4.4 concludes with a summary of the field-study support for each proposition.

4.2 PRELIMINARY QUANTITATIVE EVIDENCE: THE REGRESSION MODEL

The regression analysis conducted in this section allows for the testing of the ability of each independent variable introduced in a regression model to explain the variance that occurs in the mix of information managers use in organisations, here the dependent variable. As shown in Figure 1, seven potential determinants of the mix of information managers use in organisations were identified in the review of the management accounting, management, cognition, and judgement and decision-making literatures in Chapter 2. In addition to these 7 variables, the field study revealed another factor, the manager's functional area, as a potential explanatory variable of the mix of information the manager uses for monitoring purposes. This suggests that a total of 8

potential variables could be introduced in the regression analysis to examine their ability to explain the nature of the mix of information managers use. Before conducting the regression analysis, the choices made to reduce the loss in the statistical power of the analysis due to the use of a small sample size and of a large number of independent variables are discussed. Furthermore, the expected signs of association between each of the variables introduced in the regression model that were reviewed in Chapter 2 and the mix of information are stated to allow for a preliminary examination of the related propositions. This section concludes with a summary of the preliminary quantitative support found for the propositions examined.

4.2.1 The Regression model

Figure 1 presents a group of 7 potential determinants of the mix of information managers use in organisations. Based on the discussion in Chapter 2, each of these variables are believed to directly influence the composition of the mix of information in terms of financial and non-financial information. These 7 variables are 1) the managers' perceived external environmental uncertainty, 2) the managers' perceived organisational centralisation, 3) the nature of the decisions managers make captured by their hierarchical positions, 4) the managers' perceived task-technology, 5) the managers' perceptions of the performance indicators their superiors use to reward their performance, 6) the managers' perceptions of organisation strategy, and 7) their perceptions of the intensity of causal relationships between non-financial and financial performance indicators. The field study also revealed that the managers' functional areas within which they worked could also

influence the nature of their mix of information (More details will be provided in Section 4.3.1). This leads to a total of 10 potential independent variables (5 dummy variables and 5 more continuous variables) that could be introduced in the regression model.⁴²

As mentioned earlier, 42 managers participated in this exploratory study. The purpose of the regression analysis in this study is to supplement other quantitative and qualitative analyses to identify patterns and develop theoretical generalisations. In short, the regression analysis is used to further examine the information gathered through the questionnaire. Since the sample size was small, the number of potential independent variables to be introduced in the regression analysis was relatively large, and because of the potential for problems arising from multicollinearity, steps were undertaken to reduce the number of variables introduced in the model.

A Spearman rank-order correlation suggested that the managers' hierarchical level of decisions and their perceptions of task-technology (two candidate independent variables) were highly correlated.⁴³ The analysis revealed that managers who were ranked higher on their perception of task-technology (routine task-technology) tended to work at the operational management level. Alternatively, managers who were ranked lower on their perception of task-technology (nonroutine task-technology) tended to work at the strategic management level ($r_s = 0.50, p < .001$). Since these two variables were highly

⁴² The introduction of a categorical variable in a regression model requires the introduction of $N-1$ dummy variables where N represents the number of levels of the variable [Pedhazur, 1982]. For example, the introduction of the managers' level of decisions in the regression, i.e. strategic, tactical, and operational levels, requires the use of two dummy variables. The same number of dummy variables is also required for the introduction of the managers' functional areas (production-operations, marketing-sales, and human resources) in the regression model. Moreover, the managers' perceptions of their organisation strategy requires only one dummy variable since this variable has only 2 levels (Defender and Prospector). This implies that a total of 5 dummy variables would be required to introduce these 3 categorical variables in the regression model.

⁴³ An analysis of the correlation coefficients reported in Table 7 did not allow for the identification of any highly correlated continuous variables which could have suggested a multicollinearity problem between the continuous variables to be introduced in the regression model.

and positively correlated, this suggested that the managers' perceptions of task-technology could also act as a proxy for their level of decisions. In addition to reducing the occurrence of multicollinearity by excluding the managers' hierarchical level of decisions and keeping the managers' perceptions of task-technology in the regression model, this approach also increased the statistical power of the analysis by reducing the number of variables in the regression analysis. Adopting this approach allowed for the reduction of the number of variables to be introduced in the regression model from 10 to 8 predictive variables.

The literature review reported in Chapter 2 also revealed the absence of studies investigating the nature of the mix of information managers use across time horizons. To examine this issue, the questionnaire that was administered to the managers included a measure of the mix of information managers use on a daily, weekly, monthly, quarterly, and yearly basis. Since all managers completed this question, the same regression model was conducted at each of these time horizons.

The managers' functional areas, a variable discovered during the field studies, was listed first followed by all the other variables in the same order as they were discussed in Chapter 2.

The resulting regression model including the 8 independent variables is described as follows:

$$\text{Mix}_t = \beta_0 + \beta_1 * \text{Funmark} + \beta_2 * \text{Funpers} + \beta_3 * \text{PEU} + \beta_4 * \text{Central} + \beta_5 * \text{Task} + \beta_6 * \text{Perform} + \beta_7 * \text{Organ} + \beta_8 * \text{Causal} + \varepsilon_t$$

where:

Mix _t	=	the mix of information managers use on a daily, weekly, monthly, quarterly, and yearly basis expressed as a percentage,
Funmark	=	one if the manager works in the marketing-sales area, zero otherwise, ⁴⁴
Funpers	=	one if the manager works in the human resources area, zero otherwise,
PEU	=	the manager's perception of external environmental uncertainty on a converted scale where the total scores can range from 14 % (low) to 100 % (high),
Central	=	the manager's perception of organisation centralisation on a scale where the total scores can range from 14 (decentralised) to 70 (centralised),
Task	=	the manager's perception of this task-technology on a scale where the total scores can range from 6 (nonroutine) to 42 (routine),
Perform	=	the manager's perception of the nature of the indicators his superior uses to reward the manager's performance on a scale where total scores can range from 3 (non-financial) to 15 (financial),
Organ	=	one if the manager perceives the organisation as Prospector, zero otherwise (Defender),
Causal	=	the intensity of the manager's perception of causal relationships between financial and non-financial indicators expressed as a percentage where the total score can range from 0 % (low) to 100 % (high),
ε _t	=	a random disturbance term.

⁴⁴ Pedhazur [1982] suggests the use of a dummy coding scheme for regression models that include categorical variables or mutually exclusive groups of subjects. This method generates a "number of vectors such that, in any given vector, membership in a given category is assigned 1, while non-membership in the category is assigned 0" [p.274]. The level of significance of the regression coefficients of these vectors provides a direct test of the mean difference for the group that is assigned 1 compared to the reference group that is assigned 0 on all vectors. In this regression model, production-operations managers represent the benchmark (represented by the intercept) to which marketing-sales managers and human resources managers are compared in terms of mix of information. The main advantage of this method is that it allows multiple comparisons without alpha slippage as is usually the case in analyses of variance (Anova).

This regression analysis also provided the opportunity to examine the sign of the association between each of the independent variables introduced in the model and the mix of information managers use. Since the discussion predicting the direction of their associations was presented in Chapter 2 and stated in the preliminary propositions, testing the significance of the sign of those associations corresponds to examining the propositions. Moreover, no theory was found to predict the sign of the association between the managers' functional areas and the mix of information they use, thereby no prediction was made about the sign of their corresponding β_1 and β_2 coefficients. For each of the other independent variables introduced in the model, the expected signs of their associations are discussed below.

Proposition 1 suggests a negative association between the mix of information managers use and their perception of external environmental uncertainty (PEU). This implies that when managers are unable to predict changes or have an incomplete understanding of the relationships among the components their external environments, they may require more refined and detailed information, i.e. non-financial information, in their mix of information about the characteristics of their external environment. Consequently, the prediction is that $\beta_3 < 0$.

Proposition 3 suggests a positive association between the managers' perception of organisational centralisation (Central) and the mix of information they use. This association implies that managers who perceive their external environment as more stable and predictable would tend to adopt more centralised organisational structures which

could be monitored through the use of more aggregated information such as financial information. Consequently, the prediction is that $\beta_4 > 0$.

Proposition 7 suggests a negative association between the mix of information managers use and their perception of task-technology (Task). This association implies that managers who perceive their tasks as more analysable and repetitive, i.e. routine task, can monitor their work or organisation's processes with more detailed and specific performance measures (non-financial indicators) that reflect their task or process characteristics.⁴⁵ Consequently, the prediction is that $\beta_5 < 0$.

Proposition 8 suggests a positive association between the mix of information managers use and their perception of the nature of the indicators their superiors use to reward their performance (Perform). This implies that in situations where subordinates perceive that their reward is contingent on their performance, subordinates tend to focus on the factors or performance indicators they perceive to drive their level of reward.⁴⁶ Consequently, the prediction is that $\beta_6 > 0$.

Proposition 9 suggests a positive association between the mix of information managers use and their perception of their organisation's strategy (Organ). This implies that managers who perceive their organisation as internally and process-oriented (Defender organisations) require more detailed process-performance indicators, i.e. non-financial information, to improve the efficacy of their operations dealing with more stable technology and fewer products or services. Consequently, the prediction is that $\beta_7 > 0$.

⁴⁵ A greater score on the task-technology scale indicates a routine task; a lower score suggests a nonroutine task.

⁴⁶ A greater score on the manager's perception scale indicates a focus on financial performance indicators; a lower score suggests a focus on non-financial performance indicators.

Finally, Proposition 12 suggests a positive association between the mix of information managers use and their perception of the intensity of the causal relationships they perceive between financial and non-financial indicators (Causal). This implies that managers who select a smaller number of cues or causal relationships between non-financial and financial indicators from their task-related mental models would be more likely to focus on the cause (non-financial indicators) of the causal relationships instead of on its effect or result (financial indicators).⁴⁷ Consequently, the prediction is that β_8 is > 0 . Table 9 presents the results of this analysis.

⁴⁷ A greater proportion of causal relationships between financial and non-financial indicators relative to the total number of causal relationships a manager identified indicates a financial-related mental model. A smaller proportion of causal relationships between financial and non-financial indicators relative to the total number of causal relationships indicates a non-financial-related mental model

Table 9

Managers' mix of information

Model ^a: $Mix_i = \beta_0 + \beta_1 * Funmark + \beta_2 * Funpers + \beta_3 * PEU + \beta_4 * Central + \beta_5 * Task + \beta_6 * Perform + \beta_7 * Organ + \beta_8 * Causal + \epsilon_i$

Mix of information managers use

Prop.	Predicted sign	Daily		Weekly		Monthly		Quarterly		Yearly							
		Parameter estimates	t-stat ^b														
	β_0	?	0.1138	0.329	0.2443	0.751	0.5392	3.219	***	0.5141	3.513	***	0.3868	2.743	***		
	β_1	?	0.5312	5.714	***	0.4717	5.461	***	0.3256	7.327	***	0.2699	6.950	***	0.2333	6.234	***
	β_2	?	-0.0029	0.028		0.2126	2.268	**	0.1290	2.675	**	0.1101	2.613	**	0.1036	2.511	**
P ₁	β_3	-	0.1501	0.380		0.2121	0.574		-0.0703	-0.370		-0.1338	-0.806		-0.0219	-0.137	
P ₃	β_4	+	-0.0032	-0.806		-0.0043	-1.157		-0.0016	-0.865		-0.0015	-0.891		0.0002	0.149	
P ₇	β_5	-	-0.0097	-1.494	†	-0.0060	-0.988		-0.0088	-2.806	***	-0.0077	-2.804	***	-0.0061	-2.330	**
P ₈	β_6	+	-0.0002	-0.020		0.0086	0.813		0.0035	0.641		0.0049	1.037		0.0056	1.235	
P ₉	β_7	+	0.0742	0.952		-0.0576	-0.815		-0.0059	-0.162		-0.0048	-0.151		-0.0245	-0.800	
P ₁₂	β_8	+	0.6209	2.147	**	0.0670	0.260		0.1403	1.058		0.1713	1.477	†	0.1453	1.301	†
	Total observations			37			39			39			39			39	
	Adjusted R ²			0.543			0.450			0.612			0.606			0.562	
	F value ^c			6.352	***		4.891	***		8.500	***		8.291	***		7.084	***

^a Mix_i = the mix of information managers use expressed as a percentage (lower score: a greater proportion of non-financial information in the mix of information, greater score: a greater proportion of financial information in the mix of information). Funmark = one if managers work in the marketing-sales functional area and zero otherwise. Funpers = one if managers work in the human resources functional area and zero otherwise. PEU = the manager's perception of external environmental uncertainty expressed as percentage where the total scores can range from 14 % (low) to 100 % (high). Central = the manager's perception of organisation centralisation on a scale where the total scores can range from 14 (decentralised) to 70 (centralised). Task = the manager's perception of this task-technology on a scale where the total scores can range from 6 (nonroutine) to 42 (routine). Perform = the manager's perception of the nature of the indicators his superior uses to reward the manager's performance on a scale where total scores can range from 3 (non-financial) to 15 (financial). Organ = one if the manager's perceive the organisation as Prospector, zero otherwise (Defender). Causal = the intensity of the manager's perception of causal relationships between financial and non-financial indicators expressed as a percentage where the total score can range from 0 % (low) to 100 % (high).

^b Significance levels (two-tailed for intercept term and one-tailed for all other variables): ***<0.01, **<0.05, *<0.10, †<0.20.

^c The Besley, Kuh, and Welsch [1980] test of collinearity suggests weak dependencies between the variables included in regression model.

Table 9 presents some inconsistencies in the regression coefficients that differ significantly from zero across time horizons specially on a daily and weekly basis as compared to the monthly, quarterly, and yearly basis. The results on a monthly, quarterly, and yearly basis appear to be similar. Considering the exploratory character of this analysis and the absence of prior studies to which those results can be compared, no potential explanations were found for this inconsistency in the regression results across time horizons. Consequently, the following discussion focuses exclusively on the results of the regression analyses conducted for the monthly, quarterly, and yearly mix of information use which seemed to be more stable.

The results in Table 9 show that the managers' functional areas (Funmark and Funpers) and the managers' perceptions of task-technology (Task) explained a significant proportion of the variance that occurred in the mix of information managers use. Their regression coefficients were significant at probability levels of less than 0.05.⁴⁸ The regression model conducted on the monthly, quarterly, and yearly data explained, on average, 59 % of the variance that occurred in the mix of information managers used. The sign of the association for the managers' perceptions of their task-technology matched with its expected direction.

The negative sign of β_5 coefficient suggests that managers who perceived their work as more nonroutine (routine) tended to use a mix of information that included a greater proportion of financial (non-financial) information. Since the task-technology was

⁴⁸ Considering the exploratory nature and theory building mode of this study, a stepwise regression analysis was conducted on the model proposed in Table 9 to verify the robustness of its results. The results of the stepwise analysis were similar to those reported above in that this method identified the same variables that had a significant regression coefficient at probability levels of less than 0.05. An additional stepwise regression analysis including all the 10 variables discussed earlier in this section also provided similar results as those reported in Table 9.

highly and positively associated with the managers' hierarchical level of decisions, this would imply that strategic managers, who tended to perceive their work as more nonroutine, would also tend to use a greater proportion of financial information. Alternatively, operational managers who tended to perceive their work as more routine would also tend to use a greater proportion of non-financial information. No inference from these preliminary results was made for the nature of the mix of information tactical managers used based on this proxy since it did not allow for any discrimination at this level of decisions.

In addition, the managers' functional areas in which they worked appeared to be associated with the nature of the mix of information managers used. According to the significant and positive signs of β_1 and β_2 coefficients, the mix of information marketing-sales and human resources managers used included respectively a proportion of financial information that was significantly greater than the proportion of financial information production-operation managers used. β_1 and β_2 coefficients were significant across all time horizons except for β_2 which was insignificant for the mix of information used on a daily basis.

In summary, the results of this regression analysis suggest that the managers' functional areas and their perception of task-technology contribute to explain a significant proportion of the variance that occurred in the mix of information they used on a monthly, quarterly, and yearly basis in organisations. Testing for the significance of the regression coefficients and their relationships with the dependent variable constitutes a direct examination of the propositions that relate to the mix of information managers use.

Consequently, this preliminary quantitative evidence provides support for Proposition 7 which relates to the managers' perception of task-technology. Since the task-technology may act as a proxy for the managers' hierarchical level of decisions, the significant results on the task variable also provides indirect and partial support for Proposition 5. In short, these results would appear to suggest that strategic managers, who perceived their work as more nonroutine, would tend to use a greater proportion of financial information in their mix of information. Alternatively, operational managers who perceived their work as more routine tended to rely on a mix of information that included a greater proportion of non-financial information.

Moreover, none of the regression coefficients that relate to the managers' perceived environmental uncertainty, the managers' perception of organisational centralisation, the managers' perceptions of the performance indicators their superiors use to reward their performance, their perceptions of organisation strategy, and their perceptions of the intensity of the causal relationships between non-financial and financial indicators were significant. This absence of significant results provide no preliminary quantitative support for Propositions 1, 3, 8, 9, and 12.

4.2.2 Robustness analyses

Diverse analyses were conducted to test the robustness of the regression results presented in Table 9. An analysis was conducted to investigate the potential idiosyncratic effects relating to the manager's membership in each of the six organisations. For the purpose of this analysis, five additional dummy variables representing manager's

membership in each of the six organisations were introduced in the regression model. Because of the small sample size used in this study and the introduction of these five additional dummy variables into the regression model described in Table 9, this reduced the statistical power of the regression model and created a problem of multicollinearity. The multicollinearity problem makes it difficult and hazardous to interpret the regression coefficients since they are likely to be biased. The sign and the level of significance of the dummy variables (when significant) were not consistent across time horizons. Only the variables with significant coefficients in Table 9 remained significant after introducing the organisational dummy variables. Even though some potential organisational characteristic differences may have influenced the managers' information menu, the low power of this analysis did not allow for their detection.

Given the exploratory nature of this study, another analysis was conducted to investigate the potential effects of the requirements for publicly owned organisations to externally release information to their stakeholders on the manager's mix of information. Among the six organisations that participated in this study, one large and one medium-sized firm (each classified into a different strategy) were publicly owned, and consequently, were required to release information to the public. This organisational characteristic may have impacted on the nature of the managers' information menu. A line of research in voluntary disclosure suggests that managers would tend to release non-financial information (qualitative or quantitative) to help stakeholders in their assessment of the firm-specific assets such as quality, customer and employee satisfaction, or productivity that are believed to be not fully captured in current accounting figures or

stock market price, and consequently, could lead to a reduction in the organisation's cost of capital [Fornell et al., 1996; Ittner et al., 1995]. To detect some of the potential effects of the organisation's non-financial information supply to stakeholders on the manager's information menu, this would suggest that all managers should focus, to some extent, on non-financial information. Since executives often make the decision about the type of discretionary information that is released to the public, these managers may also require their subordinates to focus on the same information.⁴⁹ According to this line of argument, managers who work in public organisations would tend to focus on the non-financial indicators required for public disclosure and possibly use a greater proportion of non-financial information in their mix of information than managers who work in private firms. This would suggest a negative relationship between the firm's information release status (public/private) and the nature of the mix of information managers use.

In contrast, the capital market literature suggests that since markets anticipate and react to new financial information releases through the stock price, managers who work in public firms may tend to supply financial information to stakeholders. This could influence managers to focus on financial information such as cost, profit, total sales, etc. to monitor their organisation's financial performance due to its perceived impact on the firm's market value. This would suggest that managers who work in public organisations would tend to focus on and use, to a greater extent, financial information in their mix of information than managers in private firms which are not required to release financial information to the

⁴⁹ This assumption could be violated in the case where managers might use other indicators (financial or non-financial) they prefer or they perceive that act as better performance monitoring devices than those required for external reporting. This could create noise in the analysis and lead to the non-detection of the potential impacts of the public disclosure on the managers' information menu.

public. Consequently, a positive relationship would be expected between the firm's information release status (public/private) and the mix of information managers use.

The results of the introduction of an additional dummy variable for the firm's information release status (coded 0 if the firm is private and 1 if the firm is public) in the regression model described in Table 9 revealed a negative and significant relationship between the firm's characteristic and the mix of information managers use at probability levels of less than 0.05. The results suggest that managers who work in publicly owned organisations tend to use a greater proportion of non-financial information in their mix of information on a monthly, quarterly, and yearly basis than managers who work in private organisations. Even though this sensitivity analysis improved the level of significance of the variables that explained a significant proportion of the variance in the managers' mix of information presented in Table 9 and provided a 6.7 % increment in the total variance explained by the model, the introduction of this dummy variable did not reveal any of the other insignificant explanatory variables to be significant. Although these results are very interesting, they should be interpreted with caution considering the small sample size used in this study. It may also be possible that the firm's information release dummy variable captures other possible organisational characteristics such as size or industry membership (manufacturing/service) even though no significant differences were found for each of these possible variables. Even though these results are preliminary and exploratory, they appear to provide some support for the potential impact of the managers' information supply of non-financial information to stakeholder on the nature of the mix of information managers use. These preliminary results call for future research.

4.2.3 Conclusion

Overall, the results of the regression model described in Table 9 and the robustness analyses conducted on the information gathered through the questionnaire constitute preliminary and partial quantitative evidence of the explanatory power of some of the proposed determinants of the mix of information managers use in organisations. In the following sections, further quantitative analyses such as correlation analyses, mean-difference tests, Fisher's exact tests, analyses of variances and covariance will be conducted on the information gathered during the field studies to supplement the qualitative evidence collected to examine and revise each of the preliminary propositions developed in Chapter 2.

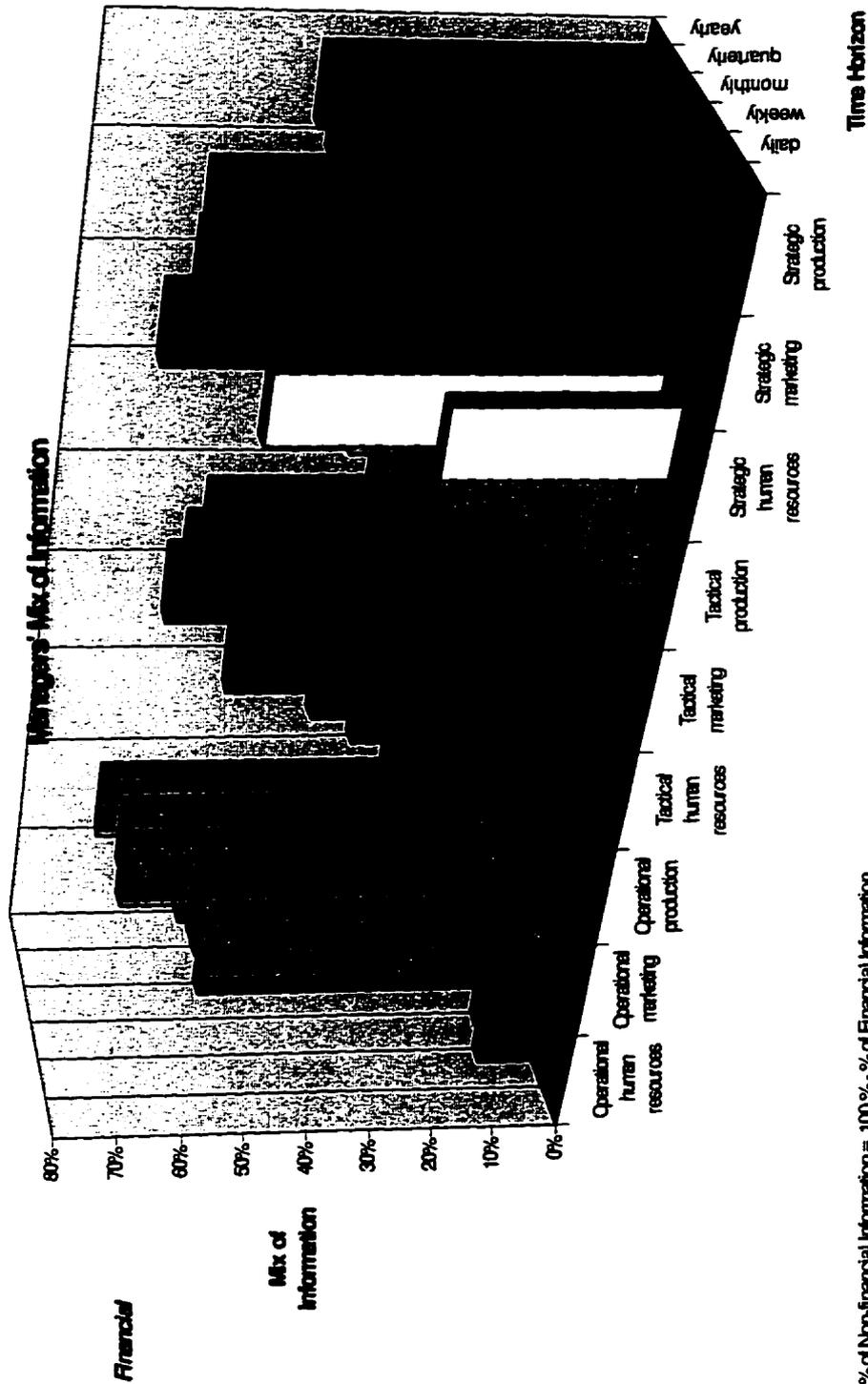
4.3 FURTHER FIELD STUDY RESULTS

4.3.1 Managers' functional area and their mix of information

In all six companies, managers sampled from the production-operation, marketing-sales, and human resources areas use a mix of quantitative financial and quantitative non-financial information obtained from many different sources. To a large extent, managers use information provided by internal sources such as accounting, management accounting, and operations information systems including financial statements, the budgeting system and variance analyses, production-operation systems, sales systems, payroll systems, and executive information systems. With the primary objective of creating variance in the sample of managers, the use of the managers' functional area as an exploratory sampling criterion revealed the importance of the managers' functional membership on the nature of the mix of information they used in organisations. In general, the results suggest that

managers attribute a great deal of importance to non-financial indicators across time horizons and particularly daily and weekly information. Figure 4 illustrates the variation of the mix of information across the functional areas, time horizons, and decision levels based on the information gathered through the questionnaire.

Figure 4



This figure shows the differences in the composition of the mix of information managers used. As shown in Figure 4, marketing-sales managers appear to rely the most of all groups surveyed, across time horizons and decision levels, on financial information for monitoring and decision-making purposes followed by human resources managers, and by production-operations managers.

The nature of the marketing-sales manager's task, among other things, is to accomplish commercial or financial transactions with customers in selling them goods, to assure a minimum sales gross margin to the organisation, to determine selling prices, and to monitor the effects of a marketing campaign on sales and competitors' market share. Marketing-sales managers appeared to take very seriously their role in achieving the organisation's sales budget and sales gross margin. It is reflected in their comments.

“ Sales people are the bread and butter of the company..... We also are those who are blamed if the sales budget is not achieved.... What really matters is to beat the market and make money for ourselves and for the organisation ”.

These comments show the importance marketing-sales managers attribute to financial matters. The interviews with marketing-sales managers revealed that they appeared to think in terms of dollars of sales or level of gross profit margin they make on the organisation's products. Although they often referred to customer satisfaction during the interviews, their focus seemed to be placed on outcomes expressed in financial terms. Moreover, when they talked about customers and product features, their main concern was what volume of sales they could get from them. Their state of mind appears to drive their use of financial information which helps them to assess how successful they were during a time period at selling the organisation's products. These comments could explain

why marketing-sales managers focus so much on financial information as a means to monitor their contribution to the organisation's financial objectives; managers' mix of information included, on average, more than 64% of financial information. The non-financial information marketing-sales managers use such as customer indices often gathered through surveys requires time to be processed, and thereby reduces its timeliness. For this reason, marketing-sales managers tended to use sales information that was quickly available through the sales booking systems as a proxy for customer satisfaction indices processed at time intervals. These results provide preliminary evidence of the importance of the financial information in the composition of the mix of information marketing-sales managers use.

While not specifying the proportion of financial information marketing managers use, Bruns and McKinnon's field-work also provides support for these results and suggests that financial information plays an important role in the information menu of marketing-sales managers. Moreover, Mia and Chenhall [1994] suggest that marketing and production functions differ in terms of monitoring activities, focusing on customer demand compared to internal processes. Such differences in these managers' focus could influence the nature of the information they may use for process monitoring purposes.

The mix of information human resources managers used tended to include a smaller proportion of financial information than the mix of information of marketing-sales managers. The field results suggest that, on average, personnel managers used 39 % of financial information in their mix of information. The human resources area deals with issues and information related to the number of labour hours, the number of sick days or

days without accidents, the hourly wage rate, fringe benefits, performance evaluation and rewards, labour contract bargaining and its application. The nature of these activities suggest close ties between the human resources department, the workers, and the other functional managers of the organisation to be effective in managing the labour force.

During the interview, most of the human resources managers mentioned they use a language or terminology in their communications with organisational members that employees and other functional managers can understand because it relates to their daily reality. For example, information such as the number of employees to be replaced for days of sickness, the number of hours in overtime, or days of absenteeism is often used by human resources managers because it is meaningful to employees and production-operations managers. However, this does not exclude the use of financial information, for example when managers deal with employees' payroll errors. Financial information such as the cost of labour or days of sickness is often made available on a weekly basis to managers who supervise workers, helping them to answer employees' questions about payroll or for budget monitoring purposes. Human resource managers, who are responsible for bargaining the employees' work contract and for its application, also provide employees with explanations containing financial information such as hourly pay rate, fringe benefits, etc. Overall, the results suggest that human resources managers tended to use a greater proportion of non-financial information in their mix of information than financial information due to the nature of their functional activities.

Last, the results also suggest that production-operations managers used a mix of information that included, on average, 70 % of non-financial information. Production-

operations managers deal with various organisational processes transforming inputs into outputs and require timely information to monitor the achievement of the desired outcomes which are mainly expressed in non-financial terms. The interviews revealed that production-operation managers focus extensively on how to get the organisation's products made the fastest, the best, and the cheapest way. They often referred during the interviews to physical or technical characteristics of the organisation's processes and products. Among other activities, production-operations managers monitor the production planning and processes, the production maintenance programmes. They also control the level of quality of the organisation's products and improve the plant's productivity through technical modifications and the introduction of new technologies. What really matters to them is how to reduce the breakdown of equipment and the production of defective products, how to avoid production bottlenecks, how much time was lost because of a power shutdown or production down-time. For them, outcomes are expressed in a physical metric that is connected in their mind to dollars.

Testing for differences in the mix of information these three groups of functional managers used, the Scheffé test, a very conservative post hoc test, conducted across time horizons reveals that the mix of information marketing-sales managers used differs significantly from the mix production-production-operations and human resources managers used at probability level of less than 0.05. As reported in Table 9 of Section 4.2.1, the significance of β_1 and β_2 coefficients indicate respectively that marketing-sales and human resources managers used a greater proportion of financial information in their mix of information than production-operation managers. Additional contrasts comparing

the mix of information marketing-sales and personnel managers revealed that marketing-sales managers used a mix of information that included a greater proportion of financial information than used by human resources managers at probability levels of less than 0.01. These results suggest that marketing-sales managers would tend to use the greatest proportion of financial information in their mix of information followed respectively by human resources and production-operation managers. As mentioned earlier in this section, these results also suggest that differences in the managers' functional task-demands tend to influence the nature of the information they use for monitoring purposes.

Furthermore, the interviews also indicate that production-operations managers, like human resources managers, appear to rely heavily on non-financial information because it is obtained on a timely basis from operation systems that are maintained independently of accounting systems. It seems that operation systems provide managers with timely, even real-time information for process monitoring purposes.

Interestingly, managers also often mentioned that they could predict their monthly financial results well before obtaining the financial statements produced by the accounting department. These production-operations managers used a set of non-financial indicators such as the production efficacy index, the rate of raw material over-consumption, and the proportion of the organisation's capacity used that seemed to be linked to the organisation's processes or captured its critical key success factors and helped them to manage and predict the achievement of its financial results. Moreover, according to these managers, monthly financial statements provide them with a "very rough picture" of what they already know, i.e. the results of the organisation's processes.

One manager's comment illustrates this issue very well:

" I do not need the monthly financial statements produced by the accounting department because I already know the results of my plant. These statements most of the time contain errors made by accountants. Too much of my managers' valuable time is spent explaining variances that result from accounting cut-offs. Financial statements produced on a quarterly basis would be better because they would decrease the time we spend to explain to accountants and to our superiors variances that are caused by accounting time-lags. They would also better reflect our results over a longer operation period. "

Without denying the value of financial information, production managers perceived that financial information obtained at longer time intervals, for example on a quarterly basis, would help to verify the reliability of the non-financial indicators used to monitor the critical organisation's processes. These comments provide support for the Lebas [1995] analogy that managing the organisation's processes through the relevant non-financial indicators helps managers to monitor more efficiently the achievement of the desired financial outcomes. This statement is also similar to the Armitage and Atkinson [1990] findings that a handful of non-financial indicators that are tied to the critical processes can help managers to monitor the achievement of the organisation's financial results on a timely basis.

Production managers appeared also convinced that floor-workers better understand the meaning of non-financial indicators because these measures reflect the way they see and think about their jobs. At four of the six organisations visited, production managers have developed or implemented a programme that provides workers with operational information on a daily basis. Of these four organisations, two have introduced a new information and production technology that provide workers with real-time

operation information. In one organisation which uses stable and well-defined production processes, employee work stations are equipped with devices that enable them to monitor the current rate of the plant's production efficacy and its estimated rate based on its current level. Employees seem to prefer this new system because it helps them to make a direct relationship between the actions they undertake in the process and their immediate impact on the plant's production efficacy rate. Although this organisation relies mainly on non-financial indicators to provide feedback to its floor-workers, this approach is similar, in essence, to Kaplan [1984] who discussed the use of financial indicators, in complex production processes, to help workers make better process decisions.

The distinct nature of the information marketing-sales managers tend to use (financial) compared to production-operation and human resources managers' (non-financial) raises the issue of the potential impact of information timeliness on the value of information they may use to monitor the achievement or to predict their organisation's financial results. During the field studies, marketing-sales managers mentioned that they tend to rely on financial information because of its ability to capture the essence of sales department processes which they perceived are directly linked with the financial success of their organisation. The financial information they use is also obtained on a timely basis. Production-operations and human resources managers often made similar comments relating to non-financial information. For example, during the interviews managers who worked in the natural resources, food processing, services, and manufacturing organisations often argued that monitoring non-financial indicators linked to important organisation's processes or key success factors helped to manage and predict the

achievement of their organisation's financial objectives. A question can be raised from these managers' comments: Does the timeliness of financial information reduce the value of non-financial information?

Based on the evidence gathered during the field studies, the answer to this question would appear to be no. Even though one medium and one small-sized organisation provided their production-operation managers with a special weekly report on repairs and maintenance expenses, and labour expenses, managers still required non-financial indicators such as the amount of down-time, the production efficacy, the number of machine-hours used, and labour yields to monitor the operations and to predict their department, plant, or organisation's financial objectives. Human resources managers also mentioned that non-financial indicators such as the number of accidents, the rate of absenteeism, the number of accidents without day loss, and the number of employee grievances received captured their functional critical success factors which they perceived to influence the financial performance of their organisation.

This evidence suggests that production-operation and human resources managers may tend to use non-financial performance indicators as predictors of their department or organisation's financial results. Since the managers' perceptions appear to be driving their information use, this may suggest that obtaining financial information on a more timely basis may be less relevant to managers who used non-financial information for prediction purposes than for managers who do not have non-financial based prediction models. Consequently, managers who rely on non-financial indicators for monitoring and prediction purposes would not reduce their use of non-financial information even if they

would receive financial information on a timely basis. In short, financial information would only act as a reliability check of the managers' pseudo non-financial prediction models. If these managers perceive the non-financial predictors they use as reliable, then they may not require the more timely financial information that others do. Consequently, the perceived value of non-financial information would not be reduced by more timely financial information such as the total cost, the department variance analysis, or the organisation's profit.

Along the same lines, marketing-sales managers who tended to rely, to a greater extent, on financial information did not appear to be willing to modify the nature of their information menu by including more non-financial information even though this information could be provided on a more timely basis. What seemed to really matter to these managers was the monitoring of the achievement of their sales and gross margin objectives through the use of financial information. To fulfil managers' demand for more timely financial information, a large and a small-sized organisation developed an executive information system giving its marketing-sales managers access on a real-time basis to sales information up-dated every day. These managers mentioned that they were satisfied with their new flexible information system which allowed them to design their own management reports. According to them, financial information represented the main core of their information menu and fulfilled their information requirements to manage and monitor the achievement of the organisation's financial results. This suggests that obtaining more non-financial information on a timely basis would not reduce the value of financial information.

Overall, the field evidence suggests that even though financial information would be provided on a more timely basis to production-operation and human resources managers and non-financial information to marketing-sales managers, this more timely information would not change the value they attribute respectively to non-financial and financial information. In short, this suggests that financial and non-financial information could act as complements rather than as substitutes. Since managers appear to be unwilling to give up their main information core in favour of financial information (for production-operations and human resources managers) or non-financial information (for marketing-sales managers), this suggests that these managers do not value each type of information as perfect economic substitutes.

Even though the field study approach did not allow the manipulation of the nature of the information made available to managers or the testing of the change in the weights placed on either type of information, the field evidence provides some support for the Hemmer [1996] analytical results. Hemmer shows that when financial and non-financial performance indicators are not perfect economic substitutes for a similar construct, such as the firm's long-term component or potential of profit, managers would not reduce the weight they place on the financial indicators used to reward their performance. On the contrary, managers would tend to increase the weight placed on both financial and non-financial information when non-financial indicators, which act as information complements, are introduced into the compensation contract and both are used to monitor the achievement of the organisation's results through managers' effort [Hemmer, 1996]. In general, this field evidence suggests that providing managers with more timely financial

(non-financial) information does not appear to influence the value they attribute to non-financial (financial) information. Moreover, the evidence also suggests that the main core of information managers use as a monitoring and prediction device to achieve the organisation's financial results could be different depending on their functional membership.

In summary, the characteristics of the activities in each functional area tend to influence the type of information managers use for performance monitoring purposes. Marketing-sales managers appeared to use the largest proportion of financial information in their mix of information. Production-operation managers used the smallest proportion of financial information in their mix of information. The mix of information human resources managers used fell between these two groups of managers. In essence, these results are similar to those reported in Simon et al. [1954] who suggested that manufacturing managers used more physical metrics than financial data.

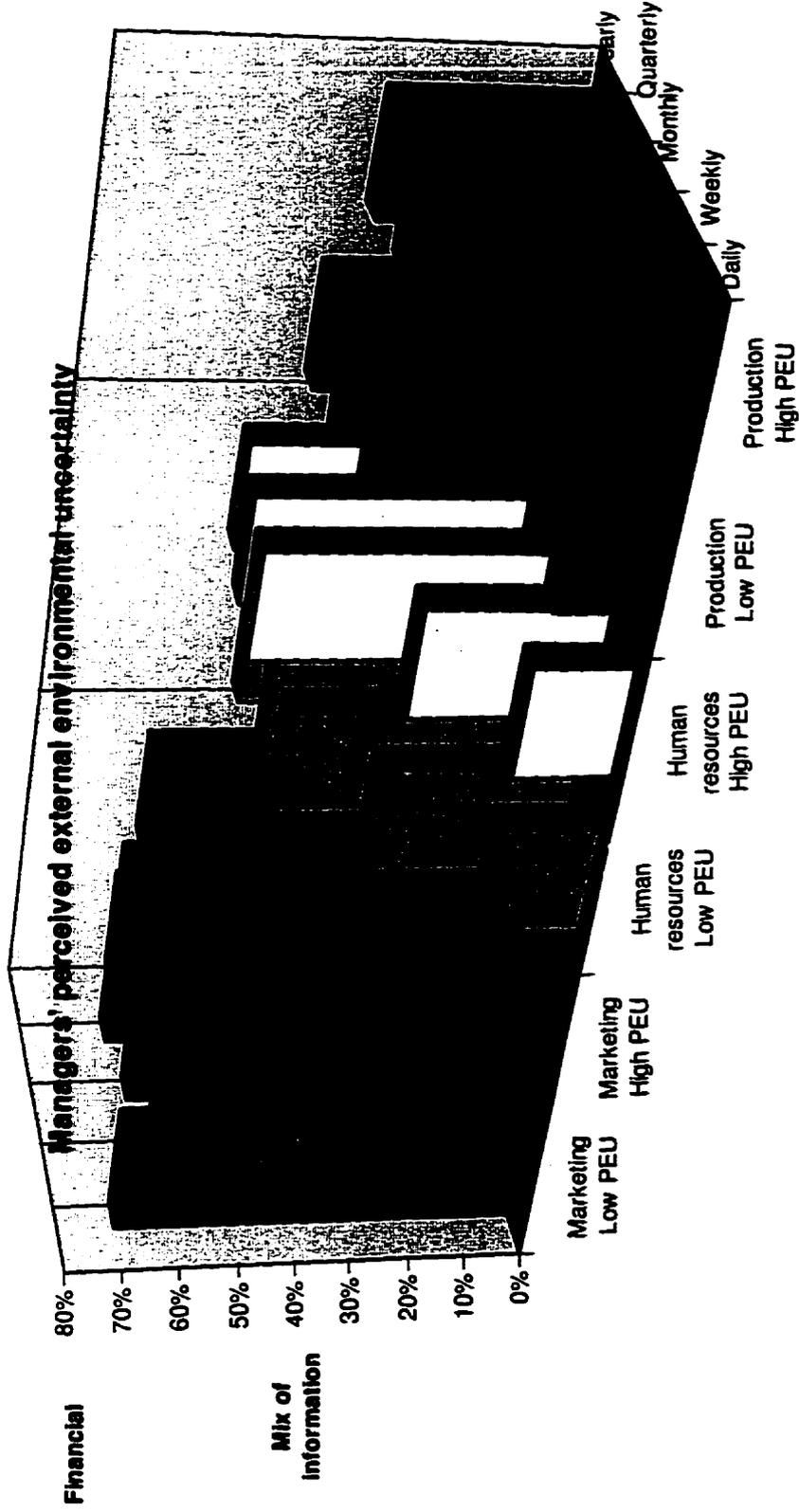
These field results also help to clarify the Nanni et al. [1990] results which suggested that managers who used non-financial indicators tended to perceive them as more useful than financial information for timely monitoring purposes. Since non-financial indicators are perceived to be closely linked to the organisation's processes and direct the manager's action as in the thermostat analogy, obtaining timely information on these non-financial indicators helps managers to assess their organisation's performance and to take the immediate steps required to achieve its desired financial results. Even though some managers may perceive non-financial (financial) information as more useful than financial (non-financial), the field evidence suggests that providing financial (non-financial) on a

more timely basis would not reduce the perceived value of non-financial (financial) information in the eyes of production-operation and human resources managers (marketing-sales managers). On the contrary, the field results suggest that financial and non-financial information could act as information complements to monitor and predict the achievement of the organisation's long-run financial results. Overall, these findings provide incremental information to Nanni et al. [1990] and Bruns and McKinnon [1993] who did not distinguish between functional areas or assess the proportion of financial and non-financial information included in the manager's mix. These preliminary results also call for future research.

4.3.2 Examination of propositions P1, P2, P3: managers' perceived external environmental uncertainty

The first three propositions refer to the association between managers' perceived external environmental uncertainty (PEU), their mix of information, and their perceptions of organisational centralisation. Proposition 1 argued that managers who perceived a high level of external environmental uncertainty would tend to use a greater proportion of non-financial information in their mix of information than would managers who perceived a low level of external environmental uncertainty. Figure 5 illustrates how managers' mix of information varies across time horizons as a function of their level of perceived external environmental uncertainty.

Figure 5



% of Non-financial information = 100% - % of Financial information

As shown in Figure 5, marketing-sales managers who perceived a high level of external environmental uncertainty, tended to use a slightly greater proportion of non-financial information in their mix of information than the ones who perceived a lower level of external environmental uncertainty.⁵⁰ This pattern was almost consistent across all time horizons. Moreover, production-operations managers, who perceived high levels of external environmental uncertainty, also tended to include a greater proportion of non-financial information in their mix of information than did those who perceived lower levels of environmental uncertainty on a monthly, quarterly, and yearly basis.

In Figure 5, human resources managers who perceived high levels of external environmental uncertainty appeared, however, to use a greater proportion of financial information on a monthly, quarterly, and yearly basis than the ones who perceive lower levels of external environmental uncertainty. Further analyses revealed that only two human resources managers perceived high levels of external environmental uncertainty. These managers also had accounting responsibilities in addition to their human resources function. Since the results of Section 4.3.2 tend to provide support for an association between the managers' functional area (which differs in task-demand) and the mix of information they use, it is most likely that these two accounting and human resources managers would tend to include additional financial performance indicators in their mix of information due to their accounting function. Consequently, such additional responsibilities could have influenced their use of information and, possibly, led them to rely more on financial information on a monthly, quarterly, and yearly basis, i.e. cycle of

⁵⁰ The managers' perceptions of external environmental uncertainty were classified into the high and low category using the PEU average score as the cutting value. Analyses of sensitivity revealed that this classification was stable.

financial reports preparation, compared to other managers who worked exclusively in the human resource area. Although speculative, these inconclusive patterns of information use would suggest that, after taking into account the proportion of financial information that relates to their accounting responsibilities, these managers' mix of information may include more non-financial information than human resources managers who perceive a lower level of external environmental uncertainty. Considering the small sample size used in this study, these results do provide only weak support for Proposition 1 and would suggest that managers may vary the composition of their mix of information to cope with a greater environmental uncertainty. Table 10 presents further characteristics of the managers' perceptions of external environmental uncertainty.

Table 10

Managers' perceived external environmental uncertainty, functional areas, and decision levels

Decision level	Production-operations		Marketing-sales		Human resources		Subtotal		Total
	Low PEU	High PEU	Low PEU	High PEU	Low PEU	High PEU	Low PEU	High PEU	
Strategic	8	1	3	4	3	1	14	6	20
Tactical	3	3	3	1	3	1	9	5	14
Operational	2	2	1	1	2		5	3	8
Total	<u>13</u>	<u>6</u>	<u>7</u>	<u>6</u>	<u>8</u>	<u>2</u>	<u>28</u>	<u>14</u>	<u>42</u>

Table 10 shows that a total of 28 managers perceived their external environment as reflecting lower levels of external uncertainty compared to 14 managers who perceived higher levels of environmental uncertainty. As shown in Table 10, it would also appear that strategic and tactical managers constitute the majority of the 14 managers who perceived high levels of PEU. According to Anthony's taxonomy of decisions, strategic and tactical managers would tend to make unstructured, complex, and relatively long-term horizon decisions such as those involving strategic planning and the development of programmes to achieve the organisation's objectives. These strategic and tactical managers could perceive high levels of uncertainty when predicting the future states of their organisation's environment. For example, managers who predict the future customer demand for the organisation's products could perceive high levels of external uncertainty when dealing with unstable and highly competitive environment compared to managers who face more stable and friendly competitive environment. This contention appears plausible since 4 strategic marketing-sales managers involved in predicting the demand for their organisation's products were part of the group of managers who perceived high levels of external uncertainty.

Interestingly, Table 10 also shows that a large proportion of the production-operations (13 of the 19) and human resources (8 of the 10) managers tended to perceive lower levels of PEU.⁵¹ This pattern suggests that the managers' functional membership could act as a filtering mechanism in reducing the managers' exposition to external environmental uncertainty. For example, strategic production-operations managers

⁵¹ A Spearman rank order correlation between the managers' functional area membership and their perceptions of external environmental uncertainty was insignificant at probability level of less than 0.10.

constitute the majority of those who perceived lower levels of uncertainty. This could imply that the corollary of the argument, referring to the inability to predict changes in customer's demand, developed for marketing-sales managers could also apply to production-operations and human resources managers. These managers could tend to perceive lower levels of external uncertainty since they are more likely to focus on the organisation's internal processes such as to improve the employee safety programmes to reduce the number of accidents or to achieve production targets established by marketing-sales managers to meet customer's demand. Consequently, because of their functional responsibilities, production-operations and human resources managers may be less exposed to the external environment and, therefore, this reduces their levels of PEU.

Along the same lines, managers who perceived high levels of external environmental uncertainty mentioned the difficulty of predicting the demand for the organisation's goods and services. They attributed this difficulty to the characteristics of their organisation's market (i.e. highly competitive or relatively new) for their products or services. Moreover, these production-operations and marketing-sales managers also appeared to rely on external sources of information such as specialised magazines to develop specific business indicators, personal contacts in organisations used as a benchmark, and panels of customers to supplement the internal sources of information. In addition, production-operation managers even used periodic samples of their competitors' products or services during their focus group or problem solving meetings. They considered that this approach helps employees to better assess the organisation's competitive position and to improve the quality of their products or services. This

additional information, which did not differ in terms of the number of external sources used, appeared to help them better predict future market conditions and their competitors' reactions.

Overall, the results of these analyses do not provide strong support for Proposition 1 which suggested that managers who perceive high level of uncertainty would tend to use a greater proportion of non-financial information in their mix of information for monitoring purposes. Only some partial qualitative evidence suggested that managers who worked in the recreation industry and perceive high level of PEU tended to rely on non-financial indicators to help them predict the demand for their organisation's service. Since no quantitative support was found in Table 9 of Section 4.2.1 including only weak qualitative evidence for Proposition 1, therefore, no general support was found for this proposition.

However, Table 10 shows a very interesting pattern of association between the managers' functional area and their perceptions of PEU. This could suggest that the managers' functional area could act as a filtering device which helps them cope with external environmental uncertainty. Moreover, the support found in Table 9 on the ability of the managers' functional area to act as a determinant of the mix of information managers use along with the pattern found in Table 10 suggests an indirect relationship between the managers' PEU and the mix of information through the managers' functional area. Although speculative, this possible relationship could explain the absence of significant results for the association between the managers' PEU and the nature of their mix of information. This absence of results provides some support for this contention.

This would suggest that the managers' functional areas could act as an intermediary between their perceptions of external environmental uncertainty and the nature of the mix of information managers use. Further analyses are conducted to identify possible patterns between the managers' PEU and another organisational characteristic, its perceived levels of centralisation.

Proposition 2 stated that managers who perceive high levels of external environmental uncertainty are more likely to work in organisations they perceive more decentralised. Table 11 provides a breakdown of the managers' perceptions of external environmental uncertainty by organisational size, and their perceptions of organisational centralisation.

Table 11

Managers' perceived external environmental uncertainty, perceptions of organisational centralisation, and organisational size

Organisational size	Managers' perceptions: centralised organisation		Managers' perceptions: decentralised organisation		Total
	Low PEU	High PEU	Low PEU	High PEU	
Small	4	4	1	4	13
Medium	9	1	2	2	14
Large	10	3	2	3	15
Total	<u>23</u>	<u>8</u>	<u>5</u>	<u>6</u>	<u>42</u>

Table 11 shows that 11 of the 14 managers who perceived high levels of external environmental uncertainty tended to work in small and medium-sized organisations. Moreover, 23 of the 28 managers who perceived low levels of external environmental uncertainty tended to work in medium and large-sized organisations. A Spearman rank-order correlation suggested that managers tended to perceive higher levels of external environmental uncertainty as they worked in smaller organisations ($r_s = 0.30$, $p < 0.10$). These findings also suggest that small and medium-sized organisations, due to their limited level of financial, physical, and human resources, could have less capability to predict and to cope with uncertainty in their external environment than large-sized organisations.

Interestingly, 5 of the 14 managers who perceived high levels of external environmental uncertainty in the service sector worked in the recreation industry. These managers' perceptions of external environmental uncertainty could be related to the characteristics of their organisation's business sector. According to them, their organisation's success depends exclusively on the weather conditions, which can be very unpredictable. The structure of their organisation remains extremely flexible to cope with unforeseen weather conditions forcing them to make the best of what mother nature decides. Moreover, its marketing and operation managers tend to use a handful of non-financial indicators such as records of the past five years' local weather conditions, the number of customers served on a specific day, the long range weather forecasts, and the speed of arrival of customers in the parking lot at 8:00 o'clock every morning to determine the additional level of human resources required to operate as smoothly as possible and to satisfy their customers.

The managers' levels of experience in their functional area appear to be associated with their perceptions of external environmental uncertainty. The Pearson product-moment correlation coefficient suggests a negative association between the managers' perceptions of external environmental uncertainty and the number of years of experience in their functional areas ($r = -0.30$, $p < 0.10$). This suggests that, as managers gain experience in their functional area, they tend to perceive less external environmental uncertainty. This could imply that the managers' ability to predict the future states of their external environment improve over time because they become able to discern among possible factors the ones that cause their external environment to change. Another explanation could be that managers become committed to a model and tend to ignore other possibly important factors that could also influence their external environment [Bazerman, 1990]. This finding is very interesting because it could help in designing better information systems to assist newcomers in a functional area in their learning process with relevant information about their external environment. (No other prior study in management accounting has ever considered this individual factor.)

The Fisher's exact test for a 2 X 2 contingency table conducted on the levels of managers' perceived external environmental uncertainty (high vs low) and their perceptions of organisational centralisation (perceived centralised vs perceived decentralised organisation) suggests that managers' perception of uncertainty differs across levels of perception of organisational centralisation at $p < 0.10$. In short, managers who perceived high (low) levels of external environmental uncertainty tend to perceive their organisation as more decentralised (centralised). This pattern of evidence provides

qualitative and quantitative support for Proposition 2 and suggests that managers who perceive high (low) levels of external environmental uncertainty would tend to work in organisations they perceive as more decentralised (centralised). These results are similar to Gul and Chia [1994] who found that managers who perceived high levels of external uncertainty tended to work in decentralised organisations. Further analyses were conducted to identify a possible relationship between the managers' perception of external environmental uncertainty, their perception of the level of organisational centralisation (or decentralisation), and the mix of information managers use for monitoring purposes.

Proposition 3 argued that managers working in organisations they perceive as more centralised would tend to use a greater proportion of financial information in their mix of information than managers in perceived decentralised organisations. The rationale for this proposition was that managers who perceive a lower level of external environmental uncertainty would tend to develop centralised organisational structures, centralised organisations should tend to use a greater proportion of financial information than decentralised organisations.⁵² However appealing, the conclusion of this line of reasoning was not supported.

During the field studies, top human resources and production managers of centralised organisations often mentioned financial indicators or reports as a primary monitoring device to detect problems such as identifying departments that did not meet their financial budgets. To perform this task, these managers relied mainly on variance

⁵² The organisational literature suggests that the context of an organisation, for example, the nature of its external environment, drives the organisation's structure such as level of centralisation, level of formalisation, etc. This suggests that managers, who make decisions about the organisation, could also adopt more centralised structure to cope with more stable external environment.

analyses and financial statements provided on a monthly basis. However, lower levels of human resources and production managers tended to rely on non-financial information because they perceived that monitoring important indicators such as the level of raw materials overuse, the level of absenteeism, the number of accidents with time loss, the number of units produced, etc. on a daily and weekly basis helped them to achieve their financial objectives. These managers also argued that they needed other indicators (non-financial) obtained on a more timely basis to fulfil their daily and weekly needs for information because financial information was not available. With regards to marketing-sales managers' mix of information, it included a large proportion of financial information consistent across all time horizons.

In more perceived decentralised organisations, lower levels of operations and personnel managers also tended to focus on specific non-financial indicators such as the number of customers served, the volume of units transported, the level of supplies consumed expressed in physical metrics, record of weather conditions for the past month to better assess their level of performance and to make some sense of the organisation's financial results. Even though the presidents and top managers of these two decentralised organisations tended to focus heavily on financial information, lower levels of operations and personnel managers monitored these non-financial indicators on a daily and weekly basis to achieve the organisation's desired financial results. Here again, marketing-sales managers tended to use a greater proportion of financial information in their mix of information across time horizons than non-financial information due to the characteristics of their functional area .

The absence of a specific pattern of information use at the organisational level differentiating more centralised from more decentralised organisations could reflect the impossibility of aggregating diverse individuals' mix of information from various functional areas at a higher level. This thesis makes the first attempt to specifically measure the mix of quantitative information managers use in organisations. Prior studies investigated the nature of information used through perceptual measures of the scope of information, i.e. internal or external, and its level of aggregation without measuring the importance of the use of specific indicators or measures included in the mix of information managers use [Gul and Chia, 1994; Chia and Chenhall, 1994; Chenhall and Morris, 1986; Gordon and Narayanan, 1984]. For these reasons, it was difficult to compare the results of these field-surveys with prior studies. Based on these qualitative results including those of the regression model presented in Table 9, no qualitative and quantitative support were found for Proposition 3.

Overall, the results provide support for Proposition 2. No support was found for Proposition 1 and 3. In general, these results suggest that managers who perceive high (low) level of external environmental uncertainty would tend to work in organisations they perceive as more decentralised (centralised). Even though no direct relationships appeared between the managers' perceptions of external environmental uncertainty and the mix of information they used, the results provide some potential explanations for an indirect association through the managers' functional area which could act as a filtering mechanism. This possible indirect relationship would make the managers' functional area

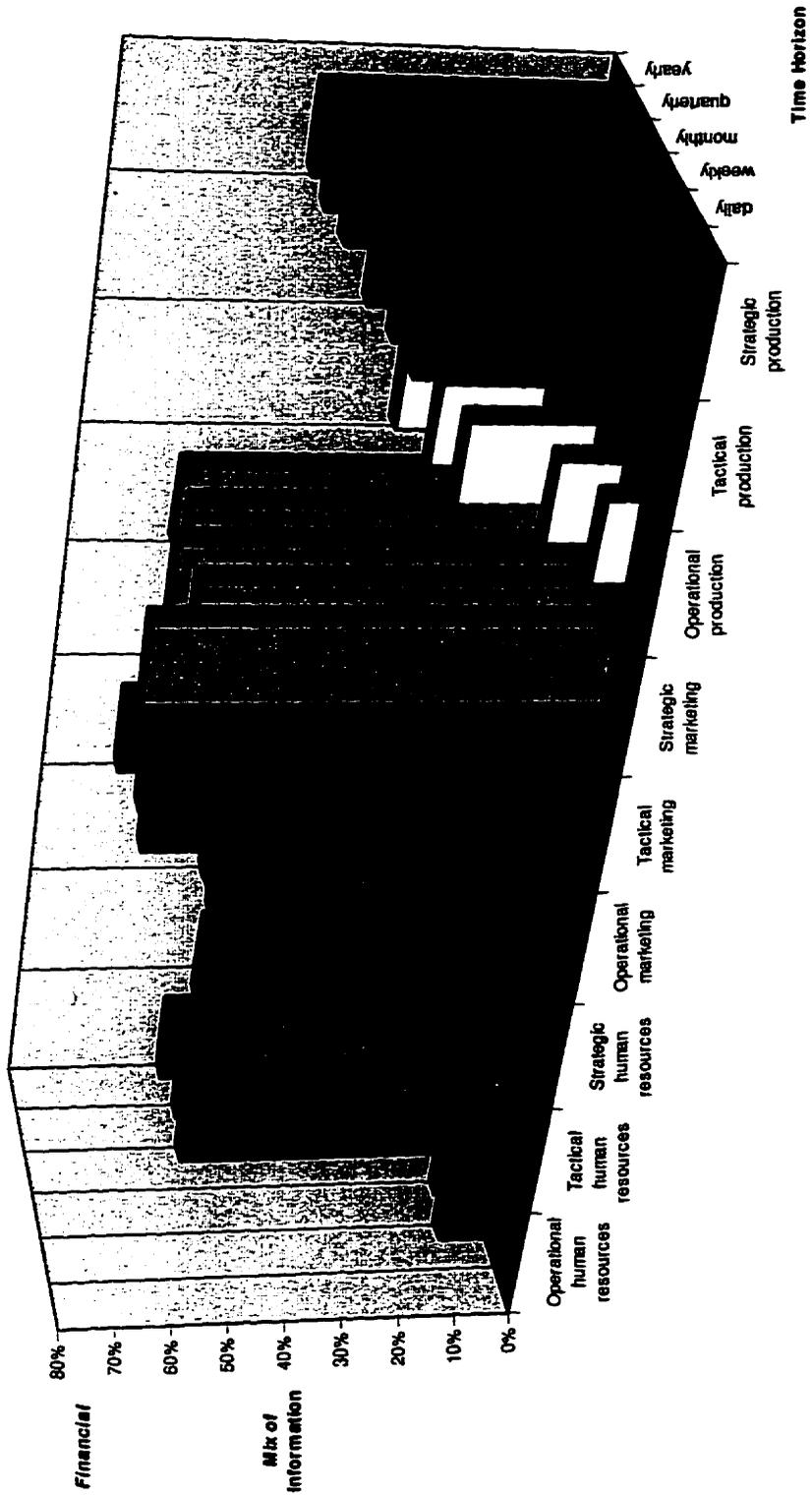
a coping device which may help managers to cope with external uncertainty and consequently, influence the nature of their mix of information.

Interestingly, no support was found for Proposition 3 suggesting the absence of association between the managers' perceptions of their organisational structure and the mix of information they use across functional areas. These results suggest that even though some managers may be pressured by their superiors to use specific types of indicators (financial or non-financial), it appeared that they still made their own decisions about the use of performance indicators that helped them monitor the organisation's main processes. Since managers seemed to make their own information choices and to differ in terms of perceptions within the organisation, it would appear very hazardous to rely exclusively on one top manager's response to classify a whole either centralised or decentralised organisation in terms of information use based on one individual. For example, Gul and Chia [1994] drew their conclusions about organisational structure and environmental uncertainty based on the responses of 48 sub-unit managers surveyed in different firms. To avoid any criticisms caused by the representativeness of the managers drawn from an organisation and any inadvertent attempt to generalise the results at a higher level of analysis, these field studies results must be interpreted exclusively at the individual level and not at the organisational level.

4.3.3 Examination of Propositions P4, P5, P6: the types of decisions

Three propositions refer to the effects of the type of decisions managers make, represented by their hierarchical position in the organisation, on the proportion of financial and non-financial information they use in their mix of information. Proposition 4 argued that strategic, tactical, and operational managers would tend to use a greater proportion of non-financial information in their mix of information than financial information. Figure 6 shows how the mix of information managers use varies across levels of decision, functional areas, and time horizons.

Figure 6
Managers' Mix of Information



% of Non-financial information = 100% - % of Financial information

In Figure 6, it can be seen that only production-operations and human resources managers tended to use a greater proportion of non-financial information in their mix of information than did marketing-sales managers. This result provides only partial support for Proposition 4.

The data gathered during the field studies suggests that production-operation managers included at least 52 % of non-financial information in their mix of information across all levels of decision and time horizons. In addition, human resources managers show a similar pattern of information use and tended to include at least 50 % of non-financial information in their mix of information.⁵³ In general, production-operations and human resources managers seem to rely even more on non-financial indicators on a daily and weekly basis than at any other time horizons.

Managers provided two main explanations for their reliance on a larger proportion of non-financial information in their mix of information over shorter time horizons. The timeliness and meaningfulness of non-financial indicators motivate the managers' use. Managers argued that they require information that is obtained on a timely or real-time basis. They also perceived that non-financial indicators were closely linked with the organisation's processes helping them to monitor the achievement of its desired financial results. For example, non-financial indicators such as the number of employees hours, the volume of rejects, the number of units produced by unit of time, the number of hours of

⁵³ Figure 6 must be interpreted cautiously. Three out of ten human resources managers who participated in this study were in charge of both accounting-finance and personnel functional areas. As discussed in Section 4.3.2, it appeared that the accounting tasks these managers accomplished could have influenced the proportion of financial information they generally used for monitoring purposes. However, when these managers were asked to provide examples of indicators they used to monitor the organisation's labour force, they mainly identified non-financial indicators such as the number of employees hours by shift or by week, or the number of sick days or days of absenteeism. This suggests that the mix of information personnel managers normally use for monitoring purposes may tend to include a greater proportion of non-financial information than the one suggested in Figure 6.

wharfage, the level of daily absenteeism, the rate of over-consumption of raw materials, the rate of production efficacy, the number of employees in temporary job re-assignment, and the number of employee accidents all helped managers to promptly intervene in the organisation's process with specific corrective actions. The use of non-financial indicators provides managers with timely (or even real time) and meaningful information that relates to the organisation's processes helping them direct their attention toward the proper set of actions to achieve the organisation's desired results.

Only in rare cases did production-operations and human resources managers mention that they were provided with financial information on a timely basis. They also indicated that it helped them to identify specific problems in the organisation's processes and to manage their expenses budget over shorter time horizons. In one medium and in one small-sized organisation, tactical and operational production managers used information systems from the accounting department to manage their maintenance or departmental costs on a weekly basis. They argued that it was easier for them to use this information than to develop other non-financial indicators to manage these costs. Since the organisation's operations appeared to be relatively stable, managers mentioned that they just needed financial information to assure that they met their monthly financial budget. During the interview, these production-operations and human resources managers argued that meeting their departmental or plant financial budget was considered very important in the organisation.⁵⁴ This could explain their use of financial information on a weekly basis as a monitoring tool to meet their monthly financial budget and to give them

⁵⁴ Managers perceived that meeting their financial budget was part of their annual performance review and influenced in some way their pay increase.

some indications of how much managers could still spend on discretionary repairs or maintenance projects before reaching the total allowed for the month.

In the other organisations, managers relied on well-defined maintenance programmes including non-financial indicators such as the number of maintenance hours spent on a specific piece of equipment, to manage their maintenance costs. Even though some financial information such as the weekly report on labour cost was used, most of the production-operation and personnel managers relied heavily on non-financial indicators to monitor their daily and weekly operations. Interestingly, they argued that as financial information became available they increased its use mainly to compare their predictions of financial results made based on the non-financial indicators they used for monitoring purposes with the current organisation's financial results. This process appears, in essence, to be similar to a reliability check of the ability of the non-financial indicators used to predict the organisation's financial results. In such situations, these managers appeared to believe that non-financial information (or vice versa) could act a substitute for financial information which is obtained at much longer time intervals.

Managers also mentioned that financial information, for example the monthly net profit or the production cost per unit, provided them with an overall view of their organisation's results. This suggests that managers may also use this more aggregated financial information as a complement to non-financial indicators. Interestingly, managers often mentioned that they were looking forward to getting, at the beginning of every month, the organisation's net profit generated during the previous period. Even though managers relied heavily on non-financial indicators for their monitoring activities it

appeared that knowing how much profit their organisation made last month or how well they met their financial budget represented an important event in managers' lives they cannot ignore, if only for the sake of assessing the reliability of their non-financial indicators. Again, these findings provide additional support for the Lebas [1995] analogy of the tree and its desired fruits represented by the organisation's financial results. In short, managers tended to focus on the factors they perceived that caused the organisation's financial results to vary. Overall, the patterns of information all production-operations and tactical personnel managers used provide support for Proposition 4 and suggest a predominance of non-financial information in the mix of information they use for monitoring purposes. T-tests conducted across time horizons on the mix of information production-operations and human resources managers used provide quantitative support for these qualitative results respectively at probability levels (one-tailed) of less than 0.05 and 0.10. These findings also provide additional support for Bruns and McKinnon [1993] who suggested that production-operations managers tended to rely heavily on non-financial information for monitoring purposes across levels of decision.

Alternatively, the mix of information marketing-sales managers used did not provide support for Proposition 4. Based on the discussion in section 4.3.1, it appears that marketing-sales managers deal constantly with financial or commercial issues such as selling goods to customers or to determine selling prices, to develop marketing campaigns increasing the organisation's sales, etc. Their functional task-demand appears to influence all marketing-sales managers to rely heavily on financial information including the selling

price, the product or service gross profit margin, the total of products returned by customers expressed in dollar, the percentage of increase in total sales, etc.

The data collected suggests that all marketing-sales managers use, on average, 64 % of financial information in their mix of information across all time horizons. The results of t-tests conducted across time horizons on the mix of information marketing-sales managers used suggest that they tended to use a greater proportion of financial information at probability level (one-tailed) of less than 0.10. This pattern of information use indicates that marketing-sales managers relied mainly on financial information due to its ability to capture economic constructs, for example the value creation process which can be captured by the organisation's gross profit margin. Marketing-sales managers also mentioned that what really matters in their work is to achieve the organisation's sales budget and to assure a stable gross profit margin in the long run. For these managers, financial information seems to capture in essence the most important factor, the selling price, about which customers can be very sensitive. Even though Bruns and McKinnon [1993] did not attempt to assess the composition of the mix of information marketing-sales managers use, their results suggested that these managers attributed a great deal of importance to financial information.

Overall, these results imply that only the mix of information production-operations and personnel managers use provide partial qualitative and quantitative support for Proposition 4. This also suggests that strategic, tactical, operational production-operations and tactical human resources managers tended to use a greater proportion of non-financial information in their mix of information than financial information.

Proposition 5 suggested that strategic managers would tend to use a greater proportion of financial information in their mix of information than tactical and operational managers. Along the same lines, Proposition 6 argued that tactical managers would tend to use a greater proportion of financial information in their mix of information than operational managers. The data gathered through the field-surveys suggests that the mix of information marketing-sales managers used did not vary according to the patterns predicted by Proposition 5 and 6. For the reasons mentioned above, all marketing-sales managers tended to rely heavily on financial information in similar proportions.

Again according to Figure 6, the proportion of financial information strategic production-operation and personnel managers used appeared to be mostly greater than the proportion tactical and operational managers used. Moreover, the proportion of financial information tactical production-operations and personnel managers used in their mix of information also appear to be mostly greater than the proportion operational managers used.⁵⁵

During the interviews, strategic, tactical, and operational managers from the production-operations and human resources functional areas referred, in different intensities, to financial and non-financial information. Being accountable to the board of directors, strategic managers tended to use the organisation's financial statements including diverse costing reports and variance analyses on a monthly, quarterly, and yearly basis. The financial budget was often mentioned during the interviews as an important

⁵⁵ Again, caution is required in interpreting the average of the mix of information personnel managers use at the operational level in Figure 6. The sample included only two human resources managers and one of them was in charge of both accounting-finance and personnel functional areas. This manager revealed during the interview that he relied heavily on non-financial information to monitor the organisation's labour force in a greater proportion than tactical or strategic personnel managers.

tool for operations planning and for managers' performance assessment. The most commonly used financial indicators were the total net profit, the total sales, the gross sales profit, the total departmental costs, the trend in sales, the level of liquidity, and the production-operations cost per unit, including all the relevant financial ratios derived from these indicators.

The interviews with tactical managers revealed they tended to use fewer financial indicators compared to strategic managers. These managers appeared to play a role of intermediary and co-ordinator between strategic and operational managers. This suggests that tactical managers provide a bridge between the strategic and operational managers' demands for information as suggested in Cooper and Kaplan [1991]. During the interviews, they often said that their superiors required them to monitor specific indicators, most of the time non-financial, such as the rate of over-consumption of raw materials, the rate of production efficacy, the number of accidents, the rate of absenteeism, the gross profit margin per product, the number of units transported, the number of customers served, the total cost per unit, the level of defects, etc. Tactical managers also attributed a great deal of importance to the variance analysis report due to their accountability for their departmental costs to their superiors. However, when they were asked on which indicators they focused most of their attention, their answers contained to a large extent non-financial indicators including those their superiors required. This evidence provides qualitative support for Proposition 5 and suggests that tactical managers tend to use financial indicators to a smaller extent than do strategic managers.

Operational managers appeared to use financial indicators to a smaller extent than did strategic and tactical managers. During the interviews, operational managers showed the researcher copies of financial reports including departmental costs or the portion of the budget cost for which they were accountable to which they referred to perform their monitoring activities. For the most part, the financial indicators used were the cost of labour in overtime, the cost of supplies used, the cost of unproductive labour, and other controllable costs. Since operational managers dealt with employees that may not have a good understanding of accounting notions or financial measures, it appeared that they preferred to use indicators labelled in physical metrics and that corresponded to the employees' daily reality.

With the exception of marketing-sales managers, only 3 of the 29 managers in the production-operations and human resources areas mentioned they were in favour of using more financial information in their communication with employees. A human resource vice-president was shocked at the idea of avoiding any financial information in his communication with the organisation's employees. His comments illustrate this issue very well:

" Most of the managers are persuaded that employees do not have the ability to understand financial indicators.....It is difficult to believe that these employees, who operate pieces of equipment and machinery worth millions of dollar, are not smart enough to understand a cost per unit. It is strange that the same employees, who we say will not understand the notion of cost if we explain it to them, are all able to manage their personal financial budget including a rent or mortgage payment. "

This suggests that, exceptionally, some managers would prefer to use more financial information in their communication to employees. These managers argued that providing

financial information could help employees to better understand the links between their actions and the financial consequences of those actions for the organisation. Although interesting, their approach was dismissed by the organisation's board of directors for confidentiality reasons. The Board indicated that financial information such as the product cost, gross profit margin, or total net profit was too strategic to be disclosed to unionised employees in the context where competitive threats emerged from the external environment. The disclosure of such strategic financial information to employee unions could lead to greater financial demands from employees in future contract negotiations or could favour strategic information leaking toward the organisation's competitors.

Alternatively, the approach of using non-financial indicators in communications with lower levels of management or employees is still alive in all the organisations visited. For example, a plant manager's most favoured greeting used, during his daily tours of the plant, reflects this positive attitude toward using non-financial information in communications with subordinates. Referring to the plant's rate of production efficacy, the plant manager often asked the subordinates who have access to this information on a real time basis directly from monitors located at their work stations or offices "How much are we doing...?". It seemed that employees did feel more involved in achieving the plant's results because they each monitored the rate of production efficacy on their new computerised system. Overall, this pattern of information use provides qualitative support for Proposition 5 and 6 and suggests that strategic and tactical managers use more financial information in their mix of information than do operational managers.

Analyses of variances (Anova) conducted on the mix of information at each of the time horizons revealed that the mix of information strategic, tactical, operational managers use significantly differs at $F_{(2,39)} > 2.56$, $p < 0.10$.⁵⁶ Additional contrasts comparing the mix of information strategic vs tactical, strategic vs operational, and tactical vs operational managers used indicated that their mix of information differs significantly from each other, across all time horizons at probability level of less than 0.10. However, after controlling for the managers' functional area membership, further contrasts revealed that only the mix of information strategic and tactical managers used included a greater proportion of financial information than operational managers at probability levels of less than 0.10. No significant differences were found between the mix of information tactical and operational managers used. These results are somewhat similar to those reported in Section 4.2.1 where the managers' perceptions of task-technology acted as a proxy for the managers' hierarchical levels of decision. These results suggest that strategic managers would tend to use a greater proportion of financial information than operational managers on a monthly, quarterly, and yearly basis. Overall, these results provide quantitative support for Proposition 5 and suggest that strategic managers would tend to use a mix of information that would include a greater proportion of financial information than tactical and operational managers. No support was found for Proposition 6.

In summary, these results provide partial qualitative support for Proposition 4, 5, and 6. This would suggest that production-operations and human resources managers may tend to use a greater proportion of non-financial information in their mix of information

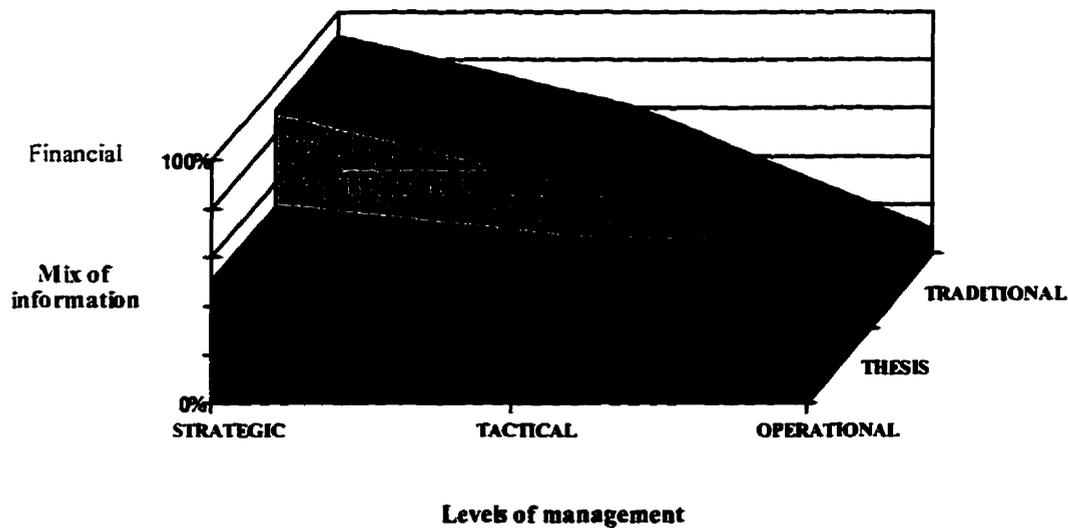
⁵⁶ The Kruskal-Wallis One-way Anova and the Median test, both nonparametric tests, also provide similar results as the ANOVAs at $p < 0.10$.

than financial information. However, due to the characteristics of the tasks marketing-sales managers accomplish, these managers tended to use a greater proportion of financial information in their mix of information than non-financial information. These findings provide additional support for Bruns and McKinnon [1993] who suggested that marketing managers relied heavily on financial information and production managers on physical metrics information.

In addition, this study's qualitative and quantitative results suggest that, overall strategic managers use respectively a greater proportion of financial information in their mix of information than tactical and operational managers. Even though only qualitative evidence was found, tactical managers also appeared to use a greater proportion of financial information in their mix of information than did operational managers. These qualitative and quantitative results also provide additional support for Nanni et al. [1990] who suggested that the manager's menu of information tended to differ across levels of decision. The use of the managers' functional area as a control variable provides additional qualitative and quantitative support for Mia and Chenhall [1994] who suggested that it influenced the nature of the information used for monitoring purposes.

Overall, these results suggest that the traditional pattern of information use that current management accounting textbooks (for example, Atkinson et al. [1995]) rely upon does not accurately reflect the nature of the mix of information managers actually use for monitoring purposes in organisations. Figure 7 illustrates the difference between the traditional view of information use and the results of this study.

Figure 7
Compared views of managers' mix of information



*% of Non-financial information = 100% - % of Financial information

Based on the results of this thesis, the mix of information all strategic, tactical, and operational managers used tended to include an important proportion of non-financial information. Alternatively, the traditional view of the managers' information menu suggests that the mix of information strategic and tactical managers use is composed of more financial information as compared to operational managers who use almost exclusively non-financial information. Since this thesis' findings, although preliminary, show an important discrepancy with the traditional view of managers' information use, this revised evidence could foster future research on the nature of the mix of information managers use and, consequently, help academics to provide a more realistic view of the information menu managers tend to use for monitoring purposes. Furthermore, it could

also support the development of information systems that better meet managers' needs for non-financial information.

4.3.4 Examination of Proposition P7: the nature of the task-technology

This thesis proposed that the nature of the managers' task technology, captured by their perceptions of the variety and analysability of the actions or processes they perform would influence the mix of information they use for monitoring purposes. Based on this definition of managers' work, Proposition 7 argued that managers who perceived their task-technology as routine would tend to use a greater proportion of non-financial information in their mix of information than managers who perceived their task-technology as nonroutine. Panel A and B of Table 12 present a breakdown of the managers' perception of their task-technology by levels of decision and functional areas.

Table 12

Managers' perceptions of task-technology

Panel A: breakdown by decision levels

	Task-technology		Total
	Routine	Nonroutine	
Decision level			
Strategic	7	13	20
Tactical	10	4	14
Operational	<u>6</u>	<u>2</u>	<u>8</u>
Total	<u><u>23</u></u>	<u><u>19</u></u>	<u><u>42</u></u>

Table 12**Managers' perceptions of task-technology****Panel B: breakdown by functional areas and decision levels**

Functional area	Decision level	Task-technology		Total
		Routine	Nonroutine	
Production-operation	strategic	1	8	9
	tactical	4	2	
	operational	4	0	
Marketing-sales	strategic	4	3	7
	tactical	3	1	
	operational	1	1	
Human resources	strategic	2	2	4
	tactical	3	1	
	operational	1	1	
	Total	13	16	29

Panel A shows that a majority of strategic managers perceived their work as nonroutine. Alternatively, most of the tactical and operational managers perceived the tasks they performed as routinised types of work. A Spearman rank-order correlation suggested that managers who were ranked higher on their perception of task-technology, i.e. routine task-technology, tended to work at the operational management level. Alternatively, managers who were ranked lower on their perception of task-technology, i.e. nonroutine task-technology, tended to work at the strategic management level ($r_s = 0.50, p < .001$). This pattern suggests that strategic managers would tend to perceive their work as containing many exceptions or unforeseen situations they have not encountered before to

a greater extent than tactical and operational managers. Alternatively, tactical and operational managers would tend to execute more repetitive and analysable tasks that are documented and divided into well understood mechanical steps.

In Panel B, marketing and personnel managers tended to perceive their tasks as slightly more routine than nonroutine. The Spearman rank-order correlation between the managers' perception of task-technology and their functional membership was insignificant at a probability level of less than 0.10. No other specific pattern appeared among production-operation managers except that strategic managers tended to perceive their work more as nonroutine than routine. Interestingly, the proportion of strategic managers who perceived their work as nonroutine appeared to be greater in the production-operation function than in any other functional areas. No specific process differences appeared among strategic managers in the production-operation area except that four of them worked in production settings that they described as very flexible in terms of manufacturing processes. They considered that the frequent changes that occurred in production scheduling due to the particularity of the customers' demand created all sorts of exceptions and new situations that they had never encountered before. According to them, these frequent changes in production scheduling influenced their perceptions of their work as nonroutine. Tactical and operational managers in all functions appeared to perceive their work as more routine in nature.

During the interviews, strategic managers often mentioned that there was a lack of formal instruction or standards they could rely on to accomplish their various and unstructured tasks including solving problems. They attributed this situation to the non-

recurrence of the problems they faced in their position. They also mentioned that their organisation relied on their management experience to deal with these exceptions instead of developing costly instruction manuals which would be very difficult to keep up-dated.

Alternatively, most of the tactical and operational managers argued that they had access to stored knowledge or instruction manuals on how to execute their work if they needed it. This suggests that the nature of the tasks tactical and operational managers accomplish or supervise are more recurrent or repetitive and structured. This implies that their tasks can be more easily decomposed into mechanical steps and documented in instruction or procedure manuals. It also suggests that non-financial indicators can be developed to monitor the level of performance of these structured and repetitive processes. The field results provide qualitative support for this assertion.

During the interviews, managers who described their work along the characteristics of routine tasks were able to quickly identify the indicators they monitored to assess the performance of the processes for which they were responsible. It appeared that the indicators managers used for monitoring the important processes were mainly non-financial. For example, production-operation monitored the production efficacy, the rate of raw materials or supplies overuse, the number of employee hours, the number of accidents that occurred in a department, the rate of absenteeism, and the volume of water used or wasted, and the number and length of the daily down-times. A similar pattern of information use appeared for human resources managers. They tended to use non-financial indicators such as the number of accidents, the level of absenteeism, and the number of workers in temporary job re-assignment. Even though marketing-sales

managers appeared to monitor financial indicators such as total sales and the product gross margin, they also provided examples of non-financial indicators that follow from financial indicators such as the number of units sold by product size, flavour, and region, the number of units delivered, the number of customers served, etc. Marketing-sales managers considered financial and non-financial indicators to be very closely linked even though they tended to use a greater proportion of financial than non-financial indicators in their mix of information as reported in Section 4.3.1.

Alternatively, when managers described their work more along the characteristics of nonroutine tasks, they often mentioned financial indicators such as the total sales, the level of profit, the percentage of product gross margin, the cost per unit sold or produced, and the variance between the current results and the financial budget. It appeared that these financial indicators provided managers with clues about the existence of problems in the operations but they required non-financial indicators when necessary to identify their causes. According to managers, the real cause of operations problems can only be found in non-financial information such as production efficacy, the amount number of downtime, the number of products returned by customers, the number of customer complaints, the number of worker accidents, the level of absenteeism, etc. This suggests that these managers who tended to perceive their task as nonroutine still required non-financial indicators to find out what really went wrong in the operations when the financial budget was not met. This illustrates very well the problems of managing after the fact with financial indicators compared to a more proactive monitoring through non-financial

indicators, obtained on a timely basis, that capture in essence the performance of the important processes of the organisation.

As shown in Table 9 of Section 4.2.1, the managers' perceptions of task-technology explained a significant proportion of the variance that occurred in the mix of information managers used on a monthly, quarterly, and yearly basis at probability level of less than 0.05. The results suggest that managers who perceived their work as more nonroutine would tend to use a greater proportion of financial information than managers who performed more routine tasks. These results provide quantitative support for Proposition 7.

Interestingly, the field studies revealed that 5 of the 19 managers who perceived their work as nonroutine had been in their position for less than a year. These newcomers considered that their work contained many exceptions and was also less analysable and could not be broken down into mechanical steps. They often mentioned that it would take them at least a year to know the type of situations they have to deal with before they see a stable pattern of events emerging from their work. Still in a period of work adaptation, these managers indicated that they asked a lot of questions about the operation processes, made observations, and took notes about the problems encountered to better understand them and to assess their level of recurrence.

The newcomers also argued that their first reaction was to use the information that was available, mainly from the monthly financial statements, financial budgets, and variance analyses. Similar to the comments reported above, these newcomers mentioned that, as they improved their understanding of the organisation's processes, they tried to

identify indicators or measures, mainly non-financial, that could help them to monitor and assess the process performance on a timely or real-time basis. They argued that the development of reliable performance indicators was part of their learning process. In short, it appeared that the more knowledgeable they were about the processes, the more confidence they had in the performance indicators they developed.

Overall, these findings suggest that the managers' perceptions of how they saw their work in terms of variety and analysability influenced the mix of information they used. However, these findings do not provide qualitative and quantitative support for Mia and Chenhall [1994] who suggested that production managers considered their work as routine and marketing managers as nonroutine.⁵⁷ Their study did not provide any specific information about the hierarchical level of the managers surveyed or about the reliability of the instruments they used to assess the nature of the managers' work. Since this thesis used well-tested instruments and controlled for the effects of hierarchical level on the managers' perception of task technology used, the field results should be robust.

In summary, qualitative and quantitative support was found for Proposition 7. This suggests that managers who perceive their work as routine tend to use a greater proportion of non-financial information in their mix of information. Alternatively, managers who perceive their work as nonroutine tend to use a greater proportion of financial information in their mix of information.

Interestingly, this thesis found that the manager's perception of task-technology was highly associated with his hierarchical position in the organisation which has been

⁵⁷ Mia and Chenhall used a sample that appeared to be biased toward production managers. They surveyed 46 production managers and 29 marketing managers in only 5 organisations.

commonly used as a proxy for the types of decisions managers make. These results suggest similarities between the level of structure of the decisions a manager makes and the analysability dimension of the decisions or tasks he performs according to Perrow's taxonomy. In effect, it could be argued that as the structure of decisions a manager makes increases, so is the analysability of his task or the ability to decompose a decision into its different steps. For example, the task of monitoring and assessing the level of rejects in a process according to the organisation's norms can be considered as an analysable task and a highly structured decision process. According to Anthony's taxonomy and to the field results, operational managers appeared to make structured decisions and execute routine tasks compared to strategic managers who tended to make unstructured decisions and execute nonroutine tasks. The identification of this new proxy could be seen as an additional contribution this thesis makes to the management accounting field since this relationship has not been used specifically in accounting research before.

In addition, the interview process revealed interesting findings about the development of non-financial indicators as part of the managers' learning process. It appeared that newcomers in a management position tended to rely, at least at the beginning, on the information that was available and for the most part was financial. However, these newcomers mentioned that as their understanding of their job and the organisation's processes improved, they tended to develop non-financial indicators to assess and monitor the performance of the processes they managed. This pattern suggests that as managers better understand the organisation's processes they become better at decomposing them into their mechanical steps and tend to develop non-financial indicators

as monitoring tools. They also mentioned they used a set of reliable non-financial indicators such as the production efficacy or the level of rejects to predict the financial results of their department or plant.

Furthermore, the interviews revealed that managers used traditional financial indicators such as total sales or level of profit as a problem detecting mechanism. However, managers who rely to a large extent on non-financial information argued that no specific explanation can be provided exclusively on the basis of financial information without looking at non-financial indicators for the details. Moreover, production-operation managers were very cynical about their peers who tended to rely on financial information; according to them the real portrait of the operation's results can be found only in the non-financial indicators by managers who truly understand the organisation's processes. These findings imply that reliable non-financial indicators can act either as a complement or as a substitute for financial information in any situation. However, financial indicators could act mainly as an information complement to non-financial information for all managers and as its substitute for strategic managers only in the absence of problems in the organisation's operations which could cause the financial results to change.⁵⁸ This approach could be considered quite controversial for the traditional view in accounting of the supremacy of financial information over any other type of information for monitoring purposes. It also provides support for Johnson and Kaplan's [1987] contentions that the management accounting discipline should be

⁵⁸ Tactical and operational managers from production-operation and human resources mentioned that financial information did not help them to manage the operations on a daily or weekly basis; what seemed to really matter to them was to obtain non-financial information.

refocused toward the development of performance indicators (non-financial) that capture the characteristics of the organisation's operations.

Overall, the field results provide qualitative evidence that marketing and human resource managers tend to perceive their task as more routine; no real pattern emerged from the production-operation area. It also appears that the managers' perception of the tasks they perform may influence the mix of information they use for monitoring purposes. These field results provide qualitative and quantitative support for Proposition 7.

4.3.5 Examination of Proposition P8: managers' perceptions of the reward systems

It is argued in this thesis that managers tend to focus their attention on measures of performance that they perceive are used to reward their performance. Along the same lines, Proposition 8 argued that managers who perceive that their performance evaluation is based on non-financial measures tend to use a greater proportion of non-financial information in their mix of information than managers who perceive that their performance is rewarded based on financial measures. The managers' perception of the indicators their superiors use to reward their performance appears to influence the mix of information managers rely on for monitoring purposes.

During the field studies, all managers were asked to identify the five most important performance measures that they perceived were used to reward their performance.⁵⁹ Among the 42 managers interviewed, nine managers mentioned that there

⁵⁹ The nature of the performance indicators, i.e. financial or non-financial, the managers identified with the highest frequency was used as a classification tool to determine the managers' perception of the measures their superior used to reward the managers' performance. For example, a manager who identified 4 non-financial performance indicators out of the five most important indicators was considered to have a non-financial focus. Alternatively, another manager who identified 3 financial performance indicators out of the five most important indicators was considered to

was no objective criterion their superior used to reward their performance including four managers who refused to answer any questions about performance evaluation and reward. Four out of the five managers who perceived their performance evaluation as extremely subjective worked in the human resources function at the tactical and operational management level. Even though they used a large proportion of non-financial indicators to monitor the labour force, in staff positions, they were not directly responsible for the organisation's employees. Their work consisted of providing advice and support to other line managers. These human resources managers remained convinced that their performance evaluation was based on subjective perceptions their superiors had of them. In contrast, 33 managers perceived that their superior relied on objective performance measures to evaluate how well managers execute their tasks and to determine their reward. These managers have also all identified five performance measures that were previously included in their mix of information when completing the questionnaire.

Table 13 presents a breakdown of these managers' perceptions of the nature of the objective performance indicators used to reward their performance as a function of their perception of task-technology and decision levels. The manager's perception of task-technology discussed in Section 4.3.4 was used as a criterion in this analysis because of its influence on the mix of information managers use for monitoring purposes.

have a financial focus. Abernethy and Lillis [1995] used a similar approach to categorise managers according to their information focus. Although, some may argue that managers could consider differently or allocate different weight to each of these five performance-reward indicators, this information was not specifically gathered during the interview or in the questionnaire, and therefore, the five indicators were all treated equally or allocate the same weight. Any weight allocation procedure could be used here but the results would be speculative and cannot be substituted for the managers' perceptions. Consequently, no weighting procedures are attempted in the analyses conducted in this section other than the method used in Abernethy and Lillis.

Table 13
Managers' perceptions of performance-reward indicators
and decision levels

Task-technology		Decision levels			Total
		Strategic	Tactical	Operational	
Routine	Financial	3	2	1	6
	Non-financial	6	7	5	18
Nonroutine	Financial	3	1	2	6
	Non-financial	10	3	2	15
		16	10	7	33

Table 13 shows that managers who perceived their work as routine tended to believe that their superior used non-financial indicators to reward the managers' performance. For example, these managers mentioned various non-financial indicators such as the number of accidents, the number and length of delays in delivery schedule, the number of units produced per labour hour, the percentage of production-operation capacity used, the number of customer complaints, the level of absenteeism, the number of employee grievances received and resolved, and the number of contacts made with new customers. This qualitative result suggests that managers who perceived their work as more routine tended to rely on non-financial indicators that captured in essence the characteristics of their work or processes they supervised, and helped them to monitor and predict their performance. They also believed that their superior used these indicators to

reward their performance. In addition during the interviews, managers appeared to perceive a direct link between how well they accomplish their work captured by the non-financial indicators they used and their reward.

These field results provide support for the MacIntosh [1981] and Ouchi [1979] control approach and suggest that in situations where the organisation's processes used to transform inputs into outputs are well understood and analysable, managers may develop non-financial indicators to monitor the process outcomes. Since managers considered that their monetary reward was attractive and contingent upon how well they did on specific performance indicators, managers tended to direct their attention toward the performance measures, in this case non-financial, they perceived to influence their level of reward. This provides qualitative support for organisational research suggesting that subordinates tend to focus on the factors that they perceive are used to determine their reward [Young et al., 1993; Lawler, 1987; 1976; Birnberg et al., 1983; Cammann, 1976].

These findings also provide conflicting evidence for Cunningham [1992] who suggested that managers tended to focus on the cost-process relationship and thereby focused on financial performance indicators instead of non-financial indicators that are linked to the organisation's processes. On the contrary, the managers interviewed mentioned that they focused on non-financial indicators because they were labelled in metrics that were more aligned with the organisation's processes and that floor-workers understood very well. Most important, they perceived that the non-financial indicators they used drove the organisation's financial results. Furthermore, information on the important non-financial indicators they monitored was obtained on a timely, even on a

real-time, basis. For all these reasons, including the perception that their superior used the same indicators they focused on to reward their performance, managers who considered their work as routine tended to focus on non-financial measures to monitor their own performance and predict their reward.

In contrast, Table 13 illustrates that managers who perceived their work as nonroutine tended to focus on financial indicators to assess their performance and predict their reward. These managers provided examples of financial performance indicators they focused on such as total sales, profit before tax, total expenses including their department costs, product gross margin, trend in selling expenses, inventory turnover, the total sales by region, and the ratio of sales discount to selling price. These field results indicate that managers who perceived their work as nonroutine tended to execute or supervise complex and unanalysable organisational processes. This made it very difficult to develop performance indicators that easily captured the organisation's process characteristics. Since the managers' perceptions of task-technology were highly correlated with their hierarchical levels of decision as mentioned earlier in Section 4.3.1 and 4.3.4, it would appear most likely that the strategic managers would tend to perceive their work as more nonroutine and, therefore, would focus on financial performance indicators for monitoring and reward purposes. As expected, these managers tended to rely on aggregated financial measures of the process outcomes compared to using indicators of the process itself defined in non-financial metrics.

These findings also provide support for MacIntosh [1981] and Ouchi [1979] control approach and suggest the use of financial indicators of the organisation's

outcomes when it is difficult to measure and monitor the process itself. In addition, these findings provide current support for Kaplan [1984] who suggested that managers who faced complex processes tended to rely on financial performance indicators to provide workers with feedback about the consequences of their actions on the organisation's financial results.

The Fisher exact test on a rearranged 2 X 2 contingency table including task-technology (routine vs nonroutine) and the nature of the five most important indicators (financial vs non-financial) managers perceived their superior used to reward the managers' performance revealed that managers differed in their perceptions of task-technology and performance indicators at a probability level of less than 0.05. The Spearman rank-order correlation reveals a significant and negative correlation between the managers' perception of task-technology and the nature of their focus on performance measures ($r_s = -0.30, p < 0.10$). This suggests that as managers perceived their work as routine they tended to focus on non-financial indicators to monitor and predict their reward; managers who perceived their work as nonroutine focused on financial performance indicators. Since managers who perceived their work as routine tended to focus on non-financial indicators that were linked with the important organisational processes they monitored, it seems logical that these same managers would also believe that if they reached the objectives on those indicators they would perform better, and thereby, would obtain a greater reward. This line of reasoning also suggests that managers would tend to use a greater proportion of the type of indicators that help them

to monitor the organisation's processes and to predict their reward in their mix of information.

Table 13 also shows that strategic managers tended to focus more on financial performance measures than non-financial measures (10 vs 6 managers) compared to tactical and operational managers who directed their attention toward non-financial measures instead of financial performance measures (10 vs 7 managers). These results suggest that the strategic managers' use of information helped them to fulfil their stewardship responsibilities toward the organisation's shareholders or owners who appeared to require financial information such as net profit, total sales, etc.

To assure the alignment of the managers' objectives with the owners', five out of six organisations used either a formal or informal bonus scheme to reward the managers' performance. Most of the strategic and tactical managers, who answered the questions related to reward systems, received a bonus as part of their total annual reward including some operational managers. The majority of the strategic and tactical managers who received a bonus and focused on financial indicators worked in the marketing-sales function. These managers mentioned that they perceived a direct relationship between their performance determined by financial indicators and their reward. They argued that financial measures such as the organisation's profit before tax, total sales, total sales by region, and product gross margins captured very well their effort to achieve the organisation's financial objectives and to maximise owners' investment. This is consistent with the contracting literature and suggests that the alignment of the managers' and

owners' interests encourages managers to exert effort to maximise the organisation's value, and consequently the owners' equity along with the managers' reward.

Interestingly, a majority of strategic and tactical managers who received a bonus and focused on non-financial indicators worked in the production-operation function. To analyse this pattern, Table 14 presents a breakdown of the managers' perceptions of the important indicators their superior used to reward their performance as a function of their functional area and perception of task-technology.

Table 14

Managers' perceptions of performance-reward indicators and functional areas

		Functional areas			Total
		Production -operation	Marketing -sales	Human resources	
Task-technology					
Routine	Financial	2			6
	Non-financial	7	2	3	12
		9	6	3	18
Nonroutine	Financial	4		3	11
	Non-financial	4			4
		8	4	3	15
				6	33

Table 14 shows that 11 out of 17 production-operation managers and 8 out of 10 marketing-sales managers tended to focus respectively on non-financial and financial performance indicators. Production-operation managers argued that they focused on the cost-process relationship through the use of non-financial indicators which helped them to

achieve the organisation's financial results and their level of reward. For example, they argued that the proportion of production-operation capacity used, the level of raw materials use and overuse, the level of production efficacy, and the level of rejects directly influence the operating costs of their organisations. These field results provide qualitative support for the evidence reported in Weirton Steel, a U.S. steel products manufacturer. Weirton Steel estimates that each point increase in its raw material yield is equivalent to a 4.7 million dollar decrease in its operating costs [Atkinson et al., 1997].

Alternatively, strategic and tactical marketing-sales managers tended to focus on financial indicators which were perceived to be directly linked with their work outcomes such as increasing the organisation's sales. Monitoring financial indicators helped marketing-sales managers to assess their performance and to achieve the organisation's financial objective such as sales growth.

These findings suggest that the characteristics of the tasks managers accomplish in their functional area influence the nature of the indicators they consider important to monitor their performance. These results indicate that, even though strategic and tactical production-operation managers may be rewarded on the organisation's financial results, it appears that they tended to focus on non-financial performance indicators that were directly linked with the organisation's processes instead of focusing directly on costing issues.

A Fisher exact test on a rearranged 2 x 2 contingency table including the nature of the five most important performance indicators managers perceive that their superior used to reward their performance (financial vs non-financial) and the manager's functional area

(production-operation and personnel vs marketing-sales) revealed that managers differ significantly in their perceptions of the indicators used to reward their performance across functional area at probability level less 0.05.⁶⁰ In addition, the Phi correlation coefficient between nominal variables suggests a significant and positive association between functional area and the nature of the performance indicators used for reward allocation [ϕ (phi) = 0.34, $p < .05$]. This suggests that production-operation managers tended to focus on non-financial performance indicators; marketing-sales managers tended to focus on financial performance indicators. No specific pattern was found for human resources managers.

In general, this association between the managers' functional area, the managers' perceived task-technology (used as a proxy for his hierarchical position), and the nature of performance-reward indicators they used as part of their mix of information provide qualitative support for Proposition 8. The field results in Section 4.3.4 suggest that managers would tend to use in their mix of information the performance indicators that helped them to monitor their organisation's functional processes. Managers also considered that their reward was contingent on their level of performance and tended to perceive that their superiors used the same indicators, they focused on for monitoring purposes, to reward their performance. Consequently, the nature of the mix of

⁶⁰ Table 14 shows no difference in the number of human resources managers who focused on financial or on non-financial performance indicators. Human resources managers were regrouped in the same category as production-operation managers because there was no difference between the number of personnel managers who focused on financial or on non-financial indicators. Moreover, the mix of information these two groups used tended to both include a greater proportion of non-financial information as reported in Section 4.3.1. This grouping approach was used to reduce the number of categories in order to meet the requirement of the Fisher exact test. To verify the absence of bias in this grouping procedure, another grouping was conducted with marketing-sales managers and human resources managers together. The results of the Fisher exact test and of the Phi coefficient were similar in strength of the association as those presented above at probability level less than 0.05.

information managers used for process monitoring and reward purposes tended to be qualitatively similar in essence when managers were asked to identify the important performance indicators they used. However, no quantitative support was found in Table 9 of Section 4.2.1 for Proposition 8 which suggested an association between the nature of the mix of information and the nature of the performance indicators managers perceived their superiors used to reward their performance.⁶¹

In summary, only qualitative support was found for Proposition 8. The field studies provide clear patterns of evidence of a potential association between the managers' perception of the performance measures their superiors use to reward their performance and the nature of the tasks managers perform. Building on the association between the managers' perception of task-technology and the mix of information they use, it is most likely that managers will tend to focus on the same types of indicators they use to monitor their performance. This would suggest that managers who perceive that their performance is rewarded based on financial performance indicators tend to use a greater proportion of financial information in their mix of information than managers who perceive that their performance is rewarded based on non-financial performance indicators.

Interestingly, the qualitative analysis revealed that even though strategic and tactical managers tend to receive bonuses based on the organisation's financial results, strategic and tactical production-operation managers appeared to focus mainly on non-financial performance indicators. They argued that they put more emphasis on non-financial indicators because these measures better captured the characteristics of the

⁶¹ Even though the nature of the performance indicators managers perceived their superiors used to reward their performance was not significant (on the mix of information used on a yearly basis: $p < 0.23$), the sign of the association is in the predicted direction.

organisation's processes which enabled them to quickly correct operation problems to achieve the organisation's financial results. According to them, they relied on the underlying cost-process relationships which implied the use of specific non-financial indicators to manage the operation costs without any of the drawbacks caused by the use of financial information such as the time lag problems previously discussed. They also mentioned that the identification or development of non-financial indicators was directly linked to the nature of the operation processes which could be interpreted in terms of the Perrow' classification of routine and nonroutine task-technology .

Alternatively, marketing-sales managers argued that financial performance indicators were directly linked with the characteristics of their work. The use of financial indicators helped them to monitor the achievement of the organisation's financial objectives which were closely tied with sales and gross profit margin. For these reasons, they tended to focus on financial performance indicators.

Even though only qualitative support was found for Proposition 8, these results suggest that individual perceptions influence the manager's focus on performance indicators. In short, what managers think and perceive is what directs their attention toward the performance indicators they focus on. Along the same lines, the managers' perception of their task-technology or work they accomplish influence the type of indicators they use, no matter how or on which basis they get paid. This implies that a better understanding of the managers' perception of their functional work and what are the factors that they perceive they are rewarded on could help in the development of information systems that would better meet the managers' needs for information which

may include an important level of non-financial information. Although partial, these results could also contribute to refocus the management accounting literature in performance measurement toward the use of non-financial indicators in accounting as a predictive tool of the organisation's financial results.

4.3.6 Examination of Proposition P9: the organisation's strategy

In this thesis, it is argued that the managers' membership in an organisation that presents specific patterns of strategy would influence the mix of information they use for monitoring purposes. This thesis relied on the Defender and the Prospector strategic types which occupy the two extremes of the continuum of the Miles and Snow [1978] strategy taxonomy. Based on this classification, Proposition 9 argued that managers who work in organisations which they perceive to use a Defender strategy tend to use a greater proportion of non-financial performance indicators in their mix of information than managers who work in Prospector organisations.

The field study revealed that production-operation managers who worked in Defender organisations appeared to deal with more stable production processes than in Prospector organisations. Even though they appeared to rely on the cost-process relationship and focused on non-financial indicators because of their work perceptions, they mentioned at some occasions during the interviews that they were less likely to have to explain cost variances to their superiors because of the stability of their operational processes if no major problems happened during a month causing them to not meet their budgets. This comment suggests that financial information could be sufficient for strategic

managers when their financial budgets are met. This exclusive pattern emerged when a strategic production-operation manager mentioned that, even though he looked at non-financial indicators across all time horizons, his first reaction each month was to determine whether his financial budget was achieved. This strategic manager argued that the operation costs were predictable based on the non-financial indicators he used on a daily and weekly basis and that, in normal situations, if nothing special happened during the month, he tended to focus additionally on financial information provided through the financial statements and variances analyses on a monthly basis. This unsettling pattern would suggest that strategic production-operation managers who work in Defender organisations might tend to focus more on financial indicators on a monthly basis when no major operation problems occurred in the period. In a context of stable operation settings, financial information could act as a substitute for non-financial indicators as mentioned in Section 4.3.4.

In addition, marketing-sales managers who worked in Defender organisations appeared to focus heavily on financial information such as product gross margins, customer gross profit after direct selling expenses, total sales by product, region, size, etc. Their main focus on product and customer profitability appeared to be caused by the nature of the products sold which tend to be mass consumption goods or to have non-differentiable product features. This unsettling evidence would suggest that marketing-sales managers who worked in Defender organisations appeared to focus to some extent on financial indicators than did managers who worked in Prospector organisations. No

specific patterns were found for human resources managers who worked in Defender organisations.

Further analyses were conducted to elucidate possible individual characteristics such as managers' experience in functional area which could lead to the identification of some patterns of information use. Since the results of sections 4.2.1, 4.3.1, and 4.3.4 suggest that the managers' perception of task-technology and functional membership explain an important proportion of the variance that occurred in the mix of information they use, these two variables are further analysed. Table 15 presents a breakdown of the managers' experience in functional areas by organisational strategy and their perceptions of task-technology.⁶²

Table 15

Managers' experience backgrounds and skills

Strategy	Task-technology	Marketing- sales background	Production- operation, human resources background	Total
		(Output)	(Throughput)	
Defender	Routine	1	14	15
	Nonroutine	2	6	8
				<hr/> 23
Prospector	Routine	4	4	8
	Nonroutine	4	7	11
				<hr/> 19
		<hr/> 11	<hr/> 31	<hr/> 42

⁶² Thomas, Litschert, and Ramaswamy [1991] tested the Miles and Snow [1978] contentions about the differences in the managers' main experience in functional areas in Defender and Prospector organisations. They classified managers as output oriented background and skills such as marketing and product development, and as throughput oriented backgrounds and skills in finance, production, and process engineering.

Table 15 provides current evidence for Thomas et al. [1991] who first tested the contentions of Miles and Snow that a greater proportion of the managers with expertise in finance, production, and process engineering, classified as throughput expertise, would tend to work in Defender organisations than in Prospector organisations. They also found a greater proportion of managers with experience in marketing-sales and product development, categorised as output expertise, in Prospector organisations than in Defender organisations. Table 15 provides current support for these prior findings (e.g. 20 throughput managers worked in Defender organisations vs 11 throughput managers in Prospector organisations; 8 output managers worked in Prospector organisations vs 3 output managers in Defender organisations).

A Fisher exact test was conducted to test the association of the managers' characteristics (throughput vs output) across organisational strategy (Defender vs Prospector). The results suggest that managers who worked in Defender organisations and Prospectors organisations differ in terms of types of experience (i.e. throughput background vs output background) at a probability level of less than 0.05. In addition, the coefficient of correlation Phi ϕ between nominal variables indicated that managers with throughput experience were more likely to work in Defender organisations than managers with an output experience (Phi ϕ = - 0.33, $p < 0.05$). In contrast, managers with output expertise developed through years of experience were more likely to work in Prospector organisations than in Defender organisations.⁶³ Providing support for Miles and Snow's

⁶³ The same analyses were conducted excluding the 6 managers who have a specific human resources background. The results were similar to those provided above at a probability level of less than 0.05. This approach was used to test the robustness of the results due to the absence of references in the Miles and Snow taxonomy to the

contention that managers who work in Defender and Prospector organisations differ in terms of their main core of experience, this result could lead to a difference in the mix of information used in the organisation. The greater number of throughput managers working in Defender organisations could influence the development of information systems, and therefore, the nature of the mix of information other managers may use. Although appealing, this pattern does not appear to influence the mix of information marketing-sales and other managers use in Defender organisations.

Table 15 also suggests that a greater proportion of managers who perceived their job as routine worked in Defender organisations than in Prospector organisations (eg. 15 Defender managers compared to 8 Prospector managers). Alternatively, a greater proportion of managers who perceived their job as nonroutine worked in Prospector organisations than in Defender organisations. Interestingly, a greater proportion of the throughput managers who worked in Defender organisations tended to perceive their work as more routine than throughput managers in Prospector organisations.⁶⁴ No other specific patterns emerged from the output managers in both groups of organisations.

Building on the results of Section 4.3.4 which suggest that managers who perceived their work as routine tended to use a greater proportion of non-financial information in their mix of information, this would suggest that throughput managers who worked in Defender organisations would also tend to perceive their work as more routine,

classification of managers who have a human resources background. This thesis classified the 6 managers with human resources background with throughput managers because of the close ties they keep with production-operation managers. The results were robust regardless of grouping method.

⁶⁴ A Fisher exact test conducted on a rearranged 2 X 2 contingency table including the manager's perception of task-technology (routine vs nonroutine) and the organisational strategy (Defender vs Prospector) was not significant at probability level of less than 0.10.

and therefore, use more non-financial information. Although appealing, no clear and strong patterns of information use were identified in Defender organisations.

In contrast, production-operation managers who worked in Prospector organisations appeared to deal with a much more flexible technology required by the organisation's product diversity including the introduction of new products. A manager's comment reflects very well the daily life of production-operation managers in Prospector organisations:

“ Well you see, I have to start the production of this new product tonight. The marketing-sales department decided three weeks ago to introduce another new product. So tonight, I have to adapt the production schedule and switch people around jobs to fit the requirements of the new production specifications,.... this is the second time this week....To work here, you have to be ingenious and very flexible to adapt yourself to new situations,..... nobody else can tell you what to do.....you are the one who stands on the firing-line This stuff happens on a regular basis,..... maybe that is why the company is so financially successful. ”

This comment suggests that managers who worked in Prospector organisations have learned to react quickly to situations they have not encountered before because of the introduction of new products and frequent changes in production scheduling caused by last minute customers' specifications. These production-operation managers often mentioned that they did not have access to a well-defined set of procedures because the production process kept changing to adapt to new situations. They also argued that all the changes that occurred in the production-operation processes due to the introduction of new products and frequent changes in customers' orders caused problems in assessing and interpreting the productivity and performance measures. This pattern and the results reported in Section 4.3.4 relating to the effects of task-technology on the mix of

information managers use suggest that these production-operation managers who perceive their work as more nonroutine would tend to rely more on financial information than on non-financial information. As shown in Table 15, this pattern would appear plausible since a majority of managers in Prospector organisations perceived their work as more nonroutine. Although appealing, no clear and strong patterns of information use were identified in Prospector organisations.

During the interviews, production-operation managers who worked in Prospector organisations also mentioned that they often referred to the details of what happened in the operation to explain variances in productivity measures and their impacts the organisation's financial results. They argued that the financial impact of the introduction of new products was often not included in their budget. Since they were pressured to achieve their financial budgets, they often had to provide explanations to their superiors about why they did not meet their budget by providing non-financial information such as the number of new products introduced during the period, the additional set-up time, etc. This would suggest that production-operation managers who work in Prospector organisations could use to some extent additional non-financial information to justify not meeting their financial budgets and that they explain financial result variables using unanticipated activities.

Similar patterns of focusing on non-financial information were also found with three marketing-sales managers who worked at different hierarchical level of decisions in Prospectors organisations. These managers appeared to pay additional attention to the customer profile, customer satisfaction, and product features than marketing-sales

managers in Defender organisations. These marketing-sales managers seemed to use, to some extent, additional non-financial information such as the number of products sold by size, colour, and region including indices of customer satisfaction for monitoring purposes. No specific patterns were found for human resource managers who worked in Prospector organisations. Overall, no clear and strong patterns of information use were found in Prospectors organisations.

In general, these unclear results do not provide qualitative support for Proposition 9 which suggested that managers who worked in Defender organisations would tend to use a greater proportion of non-financial information in their mix of information than managers who worked in Prospector organisations. The qualitative evidence would tend to suggest that managers who worked in Defender organisations made additional use of financial information contrasting with managers in Prospector organisations who relied on non-financial information to provide explanations for budget over-spending to the superior on a monthly basis. Along with the absence of clear patterns of information use, the results reported in Table 9 of Section 4.2.1 also indicate no quantitative support for Proposition 9.

In summary, no qualitative or quantitative support was found for Proposition 9. These results suggest that the mix of information managers used in Defender organisations did not differ from Prospectors organisations. The field results provide weak evidence which would suggest that managers who work in Prospector organisations would tend to use to some extent additional non-financial information compared to managers in Defender organisations who interact within a more stable production-operation setting

who could be satisfied with the use of financial information in normal situations. Since this pattern was unclear among the managers interviewed, no weight will be put on this evidence.

Overall, the results of these analyses suggest that the manager's organisational membership does not clearly influence the composition of his mix of information across all time horizons. This could imply that individual differences such as the managers' ability to perceive causal relationships between financial and non-financial concepts or indicators along with their experience backgrounds could help in explaining what drives the composition of their mix of information for monitoring purposes. Since this thesis investigates a new line of research and no specific evidence of the effects of the organisation's strategy on the mix of information managers used was provided in this study, these individual variables could provide interesting explanations for the composition of their mix of information. This suggests that although the nature of the organisation's strategy appears to be an appealing and easy method to classify managers and their information use, the results do not provide clear and strong support for such a contention. Therefore, individual variables will be analysed in the next section to investigate their ability to explain the mix of information managers use over and above the effects of their functional area, perception of task-technology, and the indicators their superiors use to reward their performance.

4.3.7 Examination of Propositions P10, P11, P12: managers' perceived causal relationships among performance measures

The last three propositions refer to the effects of the managers' perceptions of causal relationships among performance measures on the mix of information they use for monitoring purposes. In this study, it is argued that managers differ in their experience and their perceptions of the phenomena that occur in their world including their work. Research in judgement and decision-making suggests that individuals organise their world and work perceptions as they understand them in terms of simple or more complex patterns or models which include a smaller or greater number of cause-effect relationships as they accomplish more simple or complex tasks [Walsh, 1995; Calori et al., 1994; Barr et al. 1992]. Along the same lines, Proposition 10 argued that managers who execute complex tasks would tend to develop more complex patterns or models including a greater number of cause-effect relationships than managers who execute more simple tasks.

Drawing from the judgement and decision-making literature, this thesis also assumed that as managers gain experience, their perceptions of cause-effect relationships become more selective [Fiol and Huff, 1992; Bonner, 1990; Einhorn, 1974]. In short, as individuals gain experience they would tend to select a smaller number of critical task-related cause-effect relationships to monitor the achievement of desired outcomes. Pushing this line of reasoning a step further, this thesis suggested that managers would also perceive causal relationships among non-financial and financial performance measures. Building on this contention, Proposition 11 argued that experienced managers

would tend to select a smaller number of critical causal relationships between financial and non-financial performance measures compared to less-experienced managers who would tend to select a greater number of less relevant or critical cause-effect relationships between performance indicators.

Since the judgement and decision-making literature suggests that more experienced managers may tend to develop more refined task-related mental models including fewer critical cause-effect relationships, it is also possible that those managers may focus on the factors (or main organisation's processes) that they perceive drive the organisation's financial results rather than monitoring directly the effects of those factors or processes. In contrast, it might be difficult for less-experienced managers, due to their inability to recognise and select only the most relevant subset in critical cause-effect relationships from their less refined, less organised, and less accurate task-related mental models, to focus on the factors causing the results, and consequently, leading them instead to focus on the effects or results. Building on this assumption, Proposition 12 argued that managers who select a smaller number of critical causal relationships between non-financial and financial indicators (or lower intensity of cause-effects between financial and non-financial compared to the total number of causal relationships) would tend to use a greater proportion of non-financial indicators in their mix of information than managers who may select a greater number of less critical causal relationships (or higher intensity of cause-effect relationships).

During the interviews, managers provided explanations to justify their focus on specific performance and productivity measures. When managers mentioned that they

used non-financial indicators, they were asked to explain why they tended to focus on these indicators rather than any other measures such as cost or total expenses of their department. As previously reported, production-operation and human resources managers appeared to believe that non-financial information was directly linked to operation processes. They also mentioned that non-financial information helped them to quickly react to operations problems including undesired levels of output. For practical reasons, such as the availability of non-financial information on a timely, even on a real-time basis and the avoidance of timing problems involved with the use of financial information, production-operation and human resources managers tended to focus on non-financial information. Moreover, most of them were also convinced that if they achieved the desired level of outcomes captured by non-financial indicators such as the level of raw materials use and overuse, the rate of production efficacy, the number of units produced per hour, the delays in delivery schedule, the rate of defects, the number of accidents, the rate of absenteeism, the number of days of sickness without time loss, and the rate of products returned from customers, they would also achieve their financial results in terms of overall cost including the organisation's profit. This suggests that managers appeared to believe in the existence of cause-effect relationships and seemed to focus on the non-financial indicators they perceived would lead them to achieve better plant or department financial results.

In addition managers, who were relatively more experienced in their functional area, were able to quickly identify the non-financial indicators they considered crucial to the achievement of the organisation's objectives, something that relatively less-

experienced managers were unable to do. This evidence suggests that experience appears to play a role in the manager's ability to focus on specific indicators including the cause-effect relationships that are relevant to their functional area.

Interestingly, even though the marketing-sales managers argued that they perceived causal relationships between the organisation's financial results and indices of customer satisfaction captured by the number of customer complaints, the delays in delivery schedule, and the amount of product returned from customers, they tended to focus their attention toward financial information rather than non-financial information. They mentioned that financial information such as total sales and product gross margins were directly linked with the organisation's financial objectives. They also perceived that their ability to sell products to customers at the best price possible was also a good measure of their performance expressed in a metric that was available on a daily basis through the total sales bookings. A similar pattern in the speed of providing examples of important performance indicators observed among experienced production-operation and human resources managers also emerged among the more experienced marketing-sales managers.

Overall this qualitative evidence provides support for the existence of managers' perceptions of causal relationships between non-financial and financial indicators. This also suggests that the managers' functional area and their level of experience appeared to influence their focus on specific causal relationships, and thereby the mix of information they used for monitoring purposes. In addition, the availability of information also

appeared to play some role in influencing the nature of the mix of information all managers used on a daily and weekly basis as mentioned above.

Inspired by the methods used in judgement and decision-making research to assess the complexity of managers' mental models, this thesis developed an instrument to capture the managers' perception of causal relationships between concepts such as productivity, customer satisfaction, and product quality. This instrument described in Appendix B acts as a proxy for the managers' causal model complexity and captures the selected cause-effect relationships between concepts, and financial and non-financial indicators.⁶⁵ All managers completed this instrument at the end of each interview and expressed a great interest in participating in this unusual procedure which took a maximum of 5 minutes to accomplish. Managers were debriefed after having completed the instrument. Figure 8 presents the results expressed in terms of the total number of causal relationships managers identified between concepts as a function of their functional area and perception of task-technology. Perrow's task-technology taxonomy was used to discriminate among the managers' perceptions of causal relationships due to its ability to capture their perception of work complexity as reported in Section 4.3.4.

⁶⁵ The instrument described in Appendix B was used as a proxy for the number of causal relationships managers perceived between financial and non-financial indicators instead of the information gathered through Question 3, Part 2, of the field-survey questionnaire. Even though, the total number of links managers identified in the questionnaire was positively and significantly correlated ($r = 0.42$, $p < 0.01$) with the number of causal relationships identified through the instrument described in Appendix B, the interview process revealed that managers did not always identify all the important links they perceived between financial and non-financial indicators including those they relied on for monitoring purposes. This result suggests that the questionnaire provided a less reliable measure of the number of cause-effect relationships. For this reason, the instrument described in Appendix B capturing the managers' perception of causal relationships was used to conduct all the analyses required in this section.

Figure 8

Managers' complexity of causal relationships

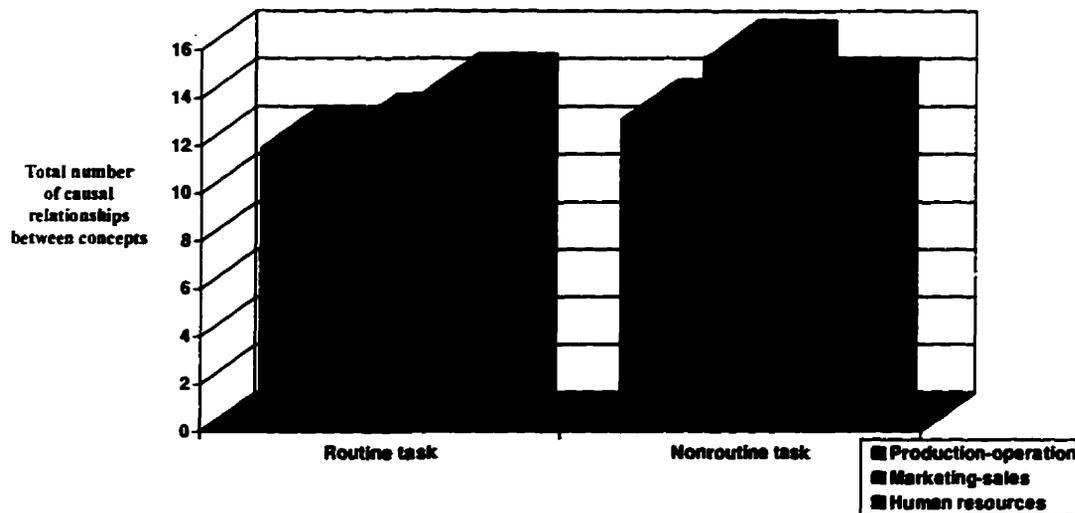


Figure 8 suggests that production-operation and marketing-sales managers who perceived their work as more routine tended to identify a smaller number of causal relationships between concepts than those who perceived their work as more nonroutine. No specific pattern appeared among human resources managers.⁶⁶ The Pearson product-moment correlation coefficient indicated that the manager's perception of task-technology was negatively associated with the number of causal relationships they perceived ($r = -0.31$, $p < 0.05$). This suggests that managers who perceived their work as more routine (more simple work) tended to identify a smaller total number of causal relationships between concepts. Alternatively, managers who perceived their work as more nonroutine (more complex work) tended to identify a greater total number of causal relationships.

⁶⁶ None of the t-tests or post hoc multiple comparisons conducted on the information presented in Figure 8 were significant at probability level of less than 0.10.

In short, these field results suggest that managers who perceived their work as more analysable and repetitive in terms of the actions they accomplished tended to identify fewer cause-effect relationships between concepts. Alternatively, managers who perceived their work as less analysable including more exceptions tended to identify more cause-effect relationships. This pattern of results appears similar to Calori et al. [1994] who found differences in assessing the mental model complexity of 26 chief executive officers (CEO) working in French and British organisations. Their results indicated that CEOs who worked in diversified and interrelated international operations (more complex work) tended to perceive more causal relationships than CEOs in focused, national and independent firms (less complex work). The similarity between Calori et al.'s findings and these field results provides additional support for the use of Perrow's task-technology taxonomy as a proxy for the complexity of the managers' task-related mental models and work complexity that was found to vary across the types of decisions managers make in organisations (See Section 4.3.4 for details). This evidence provides support for Proposition 10 which suggested that managers who execute more complex (nonroutine) tasks would tend to develop more complex task-related models of cause-effect relationships than managers who accomplish more simple (routine) tasks. Overall, these results provide qualitative and quantitative support for Proposition 10 and suggest that managers who execute complex tasks would tend to develop more complex task-related mental models than managers who execute more simple tasks.

Proposition 11 suggested that experienced managers may tend to select a smaller number of critical causal relationships between non-financial and financial indicators than

less-experienced managers. Building on the ability of Perrow's task-technology taxonomy to capture the complexity of the managers' task-related mental models, Figure 9 illustrates how managers differ in terms of the total number of causal relationships they identified between financial and non-financial indicators.

Figure 9

Managers' perceptions of causal relationships between financial and non-financial indicators

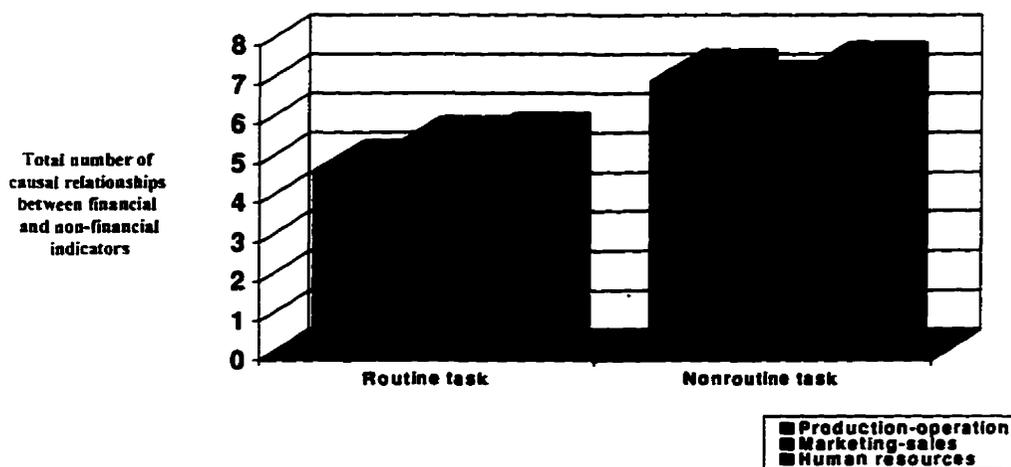


Figure 9 suggests that managers who perceived their work as more routine tended to identify a smaller number of critical causal relationships between financial and non-financial indicators than managers who executed more complex work defined as nonroutine. Even though managers appeared to differ in terms of the total number of causal relationships they identified between concepts, Figure 9 provides preliminary evidence that managers also vary in the number of causal relationships they identified between non-financial and financial indicators. Analyses were conducted to investigate the effect of the managers' level of experience on the total number of causal relationships they identified between financial and non-financial indicators as suggested in Proposition 11.

Along these lines, Table 16 presents a breakdown of managers' perceptions of causal relationships between non-financial and financial indicators as a function of their level of experience and functional area membership.

Table 16
Managers' perceptions of causal relationships
and functional areas

Level of experience in their functional area ⁶⁷	Perception of causal relationships ⁶⁸	Functional area			Total
		Production -operation	Marketing -sales	Human resources	
Less-experienced		7	9	4	20
Experienced		12	4	6	22
		<u>19</u>	<u>13</u>	<u>10</u>	<u>42</u>

Even though no strong patterns appear between the total number of less-experienced managers who perceived a greater and a smaller number of cause-effects and also between more experienced managers, Table 16 however suggests a similar pattern for production-operation and marketing-sales managers. In short, Table 16 suggests that a greater

⁶⁷ The managers' years of experience in their functional area and the total number of causal relationships they perceived between financial and non-financial indicators were classified respectively as less-experienced vs experienced and few cause-effects vs many cause-effects based on a split at the average (15 years which is also the median).

⁶⁸ The number of causal relationships managers identified were classified respectively as few cause-effects and many cause-effects based on a split at the average, i.e. 6 cause-effects which is also the value of the median. Analyses of sensitivity conducted on the cutting value suggest that the results of this classification are robust.

number of managers who are less-experienced in production-operation and marketing-sales area, both tended to perceive respectively a greater number of causal relationships between financial and non-financial indicators (9 managers vs 7 managers). Moreover, a greater number of experienced production-operation and marketing-sales managers, both tended to identify a smaller number of cause-effect relationships (10 managers vs 6 managers). No consistent patterns emerged among human resources managers. In addition, none of the Fisher exact tests and Chi-squares conducted on Table 16 were significant at probability level of less than 0.10.

Although speculative, this unsettling and weak pattern of evidence could suggest that experienced managers may tend to perceive a smaller number of causal relationships between financial and non-financial indicators. Alternatively, less-experienced managers may tend to perceive a greater number of causal relationships. At this stage, no comparisons could be made between experienced and less-experienced managers since no constant pattern emerge from Table 16.

To further examine this unsettling pattern of evidence, an analysis of covariance was conducted on the total number of causal relationships managers identified between financial and non-financial indicators as a function of their level of experience (high vs low) and the managers' type of functional experience, output (marketing) vs throughput (production-operations and human resources) after controlling for their perceptions of task-technology as a covariate. The "throughput vs output" manager experience grouping was chosen because these labels appear to regroup managers' with a similar focus, i.e. internal process focus compared to customer oriented focus, as discussed in Section 4.3.6.

The managers' perceptions of task-technology are used as a covariate because of its association with the managers' mental model complexity and due to its ability to differentiate between the number of non-financial and financial performance indicators as shown in Figure 9. Table 17 presents the results of the analysis.

Table 17

**Analysis of Covariance of the total number of causal relationships
between non-financial and financial indicators (N= 42)**

Source of variance	SS	df	MS	F	p-value
Managers' level of experience	20.98	1	20.98	2.820	*
Managers' functional characteristics	0.24	1	0.24	0.032	
Experience by functional characteristics	12.33	1	12.33	1.657	
Covariate					
Managers' perception of task-technology	45.05	1	45.05	6.054	**
Error	275.29	37	7.44		

Note: *** p<0.01, ** p<0.05, *p<0.10

Table 17 shows that the number of causal relationships managers identified varied significantly with the main effect of managers' level of experience, $F_{(1, 37)} = 2.820$, $p < 0.10$ providing support for the effect of the level of experience on the number of critical cause-effects.⁶⁹ The results of Table 17 also reinforce the ability of the task-technology to act as a covariate. Experienced managers identified, on average, 5.1 causal relationships compared to 6.9 cause-effects for less-experienced managers.⁷⁰ These results suggest

⁶⁹ According to Howell [1992], the sample size used in this analysis ensures the non-violation of the normality assumption. The linearity assumption between the dependent variable and the covariate was satisfied based on the plot of the residuals. The test for the assumption of homogeneity of regression suggests that it was not violated ($F_{(2,36)} = 0.009$, $p > 0.10$). Howell [1992] recommends to use the Welch procedure, that has both power and protection against Type I errors, to correct for heterogeneity of variance when the Bartlett - Box test is significant (here, Bartlett - Box was $F_{(3, 696)} = 3.06$, $p < 0.05$). After corrections for the heterogeneity of variance, the results of the covariance analysis were at probability levels similar to those reported in Table 17.

⁷⁰ The means are the adjusted means after taking into account the covariate.

that managers seem to differ in terms of the total number of critical causal relationships they perceive between financial and non-financial indicators as a function of their level of experience and perceptions of their work classified as routine and nonroutine. Although preliminary and highly exploratory considering the small sample size used in this study, these findings provide qualitative and quantitative support for Proposition 11 and suggest that experienced managers would tend to select a smaller number of critical causal relationships between financial and non-financial indicators compared to less-experienced managers who would tend to select a greater number of possibly less relevant causal relationships.

Proposition 12 argued that managers who select a smaller number of critical causal relationships between financial and non-financial indicators tend to use a greater proportion of non-financial information in their mix of information than managers who select a greater number of cause-effect relationships. During the field interviews, relatively more experienced managers who appeared to pay a great deal of attention to specific cause-effect relationships mentioned that their achievement of specific levels of performance on non-financial indicators helped them to reach their department or plant's financial objectives along with those of their organisation. For example, managers believed that the rate of raw materials use and overuse, the number of units transported or produced, the number of tickets sold, the percentage of production-operation capacity used, the rate of product defects, the level of customer satisfaction, the number and reduction in the time of set-ups, and the number of accidents with time loss, all drove the financial results of their organisation. These experienced managers appeared to focus on a

few important indicators on a daily and weekly basis to monitor and predict the organisation's financial results. They also tended to use the non-financial information produced by these indicators.

In contrast, relatively less-experienced managers were vague in their answers about the indicators they perceived important to monitor their performance. Although they mentioned using financial statements and the annual budget for their functional area, no clear pattern of information use appeared among these managers. This could suggest that less-experienced managers who selected more links between financial and non-financial information may tend to rely heavily on financial information that was produced on a monthly basis. These weak patterns provide some support for Proposition 12 and suggest that managers who perceive a smaller number of causal relationships tend to use a greater proportion of non-financial information in their mix of information than managers who perceive a greater number of causal relationships.

The results of the regression analysis reported in Table 9 of Section 4.2.1 provide quantitative support for Proposition 12. Using a relative measure of the intensity of the managers' perceptions of causal relationships between non-financial and financial indicators, the results suggest that managers who perceived a higher level of intensity of causal relationships between financial and non-financial indicators tended to use a greater proportion of financial information in their mix of information on a daily basis at probability level of less than 0.05. Alternatively, managers who perceived a lower intensity of causal relationships between financial and non-financial information tended to use a greater proportion of non-financial information.

Overall, these results provide partial qualitative and quantitative support for Proposition 12 and suggest that managers who select a smaller number of causal relationships between financial and non-financial indicators (or a lower intensity of causal relationships between financial and non-financial indicators) would tend to rely intensively on non-financial information for monitoring purposes. Alternatively, managers who select a greater number of causal relationships between financial and non-financial indicators (or a higher intensity of cause-effects) would tend to use a greater proportion of financial information in their mix of information. Although preliminary and highly exploratory, these findings could open the way to a new area of research in management accounting through the use of individual variables such as perception, experience, and beliefs to further investigate on a large scale their effects on the mix of information managers use.

In summary, these results provide qualitative and quantitative support for Propositions 10, 11, and 12. In short, evidence suggests that managers who considered their work as more complex tended to select a greater number of critical causal relationships than managers who performed less complex tasks. The results also suggest that relatively more experienced managers would tend to select a smaller number of critical causal relationships than relatively less-experienced managers. Last, partial qualitative and quantitative evidence provides support for the contention that managers who select a relatively greater number of critical causal relationships between financial and non-financial information would tend to include in their mix of information a greater proportion of financial information than managers who select a relatively smaller number of causal relationships.

Since this thesis represents the first attempt in management accounting to assess the causal relationships managers perceive between financial and non-financial indicators, it was difficult to find other studies either supporting or contradicting these field results. Even though no specific attempt was made to assess the manager's perception of cause-effect relationships, the Bruns and McKinnon [1993] field-study results suggested the existence of such perceptions in the reported comments of managers. Bruns and McKinnon indicated that experienced operations managers appeared to perceive direct relationships between the variation of non-financial indicators on the effects on the organisation's financial results. Curtis [1994] tested the predictive power of a set of non-financial indicators on the organisation's financial results using archival data. He found that 90 % of the earnings before tax of organisations involved in intensive research and development was explained by non-financial indicators. Although partial, these prior studies provide some support for this thesis' contention that causal relationships between financial and non-financial indicators do exist and that managers differ in their ability to rely on them in making their choice of information use. In addition, the managers' focus on specific causal relationships between financial and non-financial and the non-availability of the information they require for monitoring purposes could also help explain the development of parallel or ad hoc sources of information, i.e. information kept on systems that are not legitimised by the top management, observed during the field studies.

Interestingly, 12 managers from all organisational sizes, functional areas, and levels of experience revealed, during the interviews, that they kept parallel or ad hoc sources of

information for monitoring purposes. Table 18 presents a breakdown of the nature of the parallel sources of information by functional areas.

Table 18

**The nature of parallel information source
and the manager's functional area**

Nature of the parallel source of information	Functional area			Total
	Production -operation	Marketing -sales	Human resources	
Financial	1	2		3
Non-financial	<u>4</u>	<u>1</u>	<u>4</u>	<u>9</u>
	<u>5</u>	<u>3</u>	<u>4</u>	<u>12</u>

As shown in Table 18, managers tended to develop more parallel sources of non-financial information than financial information. In short, the majority of the managers who maintained parallel sources of non-financial information worked in production-operation and human resources functions. This result was expected since these managers appeared to use a mix of information, the majority of it non-financial, and that the organisation's main core information systems provided financial information which did not fulfil the managers' need for non-financial information required for daily monitoring purposes. These managers mentioned that their parallel sources of the non-financial information contained mainly descriptive statistics on the labour force and customers including productivity factors such as the rate of raw materials use and overuse, the plant's level of productivity, etc. They argued that this information was either unavailable through the

institutionalised information systems or unavailable at the level of information aggregation they required to assess the improvement of the operation's performance. Managers who maintained parallel information systems felt strongly about the information they kept because they perceived it as essential to improving the organisation's performance. This suggests that these managers maintained parallel records for the leading indicators of their cause-effect relationships that drive their organisation's financial results. They also mentioned that keeping track of these factors helped them to monitor more closely what was happening in their function.

Alternatively, the financial information kept in parallel systems was mainly detailed operation expenses including the residual financial budget left for the year. These managers argued that the information kept on their systems was more detailed than the one provided by the institutionalised information systems. Since the information was more detailed, they also felt that it better helped them to monitor their financial budget.

Table 19 provides a breakdown of the managers who maintained parallel information systems as a function of their hierarchical position.

Table 19

**The nature of parallel information source
and the manager's hierarchical position**

Nature of the parallel source of information	Hierarchical position			Total
	Strategic	Tactical	Operational	
Financial	1	2		3
Non-financial	<u>1</u>	<u>5</u>	<u>3</u>	<u>9</u>
	<u>2</u>	<u>7</u>	<u>3</u>	<u>12</u>

Table 19 shows that 10 of the 12 managers who maintained parallel sources of information worked at the tactical and operational level of management. In addition, 8 of the 10 tactical and operational managers used non-financial information coming from their parallel information systems. These managers argued that they developed their parallel systems because they needed information on a timely basis in the metric that matched with the organisation's processes they monitored. In one case, a manager who was transferred to another plant in the same organisation introduced all the same indicators he used in his prior position at the other plant. He argued that this information was essential to accomplish his job. This specific pattern provides support for the contention that the managers' perception of cause-effect relationships could drive their information demand as suggested in Proposition 12.

Only two managers at the strategic level developed their own parallel information systems. Interestingly, an executive information system existed in both organisations however, these two strategic managers did not want to use it because it required too much of their time to learn how to use it. All of the other strategic managers and some of tactical managers who had access to this executive information system and who were interviewed appeared extremely satisfied with it and did not maintain any parallel information systems. With the exception of those two strategic managers, this pattern generally suggests that managers who have the authority to influence the development of performance indicators and to determine the type of information systems that will provide them with the information they want will be less likely to develop their own parallel information systems. For example, the development of formal and flexible information

systems such as executive information systems, including all other information systems that provide managers with the information they require to accomplish their work, would tend to reduce the emergence of parallel information systems in the organisations.

In general, these results support Clancy and Collins [1979], the only other study to specifically investigate the emergence of parallel information systems in accounting subsequent to the Simon et al. [1954] work. Clancy and Collins defined parallel or informal information systems as any information system that is maintained in the organisation and that is not legitimised by the top management. Simon et al. reported anecdotal evidence of the use of black books and bootleg reports that contained figures transcribed from the accounting reports or simply translated into physical terms. As reported above, this phenomenon appears to be still alive and well in the organisations visited during these interviews. These field results provide current support for Clancy and Collins' contention that managers who are provided with information they perceive to be less informative regarding the main organisational processes would tend to develop parallel sources of information to fulfil their information needs.

In conclusion, these field results provide the qualitative and quantitative evidence that managers do vary in terms of perceptions of causal relationships which also appears to influence the nature of their mix of information including the development of parallel information systems that provide them with the information they required to monitor the organisation's processes. These findings could also open a new area of research in the management accounting and information system disciplines to further study the effects of

managers' perceptions of causal relationships between financial and non-financial indicators on the nature of the information used and its impact on the development of information systems. Moreover, the identification in future research of the non-financial indicators that drive the organisation's financial results could help to the development of better predicting models of the organisation's financial performance. Finally, these field results could also help in teaching business students about leading performance indicators used at the operating level in organisations today. This could bring, as suggested by Mintzberg [1989], some real world relevance to the classroom.

4.4 SUMMARY OF THE FIELD RESULTS

This thesis developed and reviewed twelve propositions, nine of which were specifically related to the nature of the mix of information managers would use in organisations. A total of 42 managers working in three functional areas drawn from six firms from diverse sectors of activities provided the data required to revise the theoretical propositions developed in Chapter 2. Table 20 presents the summary of the support found for each of the propositions.

Table 20

Summary of the propositions' support

Proposition number	Description	Predicted Sign of the association	Qualitative support	Quantitative support	Results
	(F= financial information, NF = non-financial information)				
P1	Perceived level of external environmental uncertainty and its impact on the mix of information (High PEU => NF mix)	-	No	No	Rejected
P2	Perceived level of external environmental uncertainty and the managers' perception of organisational centralisation (High PEU => decentralisation)	+	Yes	Yes	Support found
P3	Perceived level of organisational centralisation and the managers' mix of information (Centralisation => F mix)	+	No	No	Rejected
P4	Proportion of NF in the mix of information is greater than the proportion of F information in the mix of information strategic, tactical, and operational managers use	N/A	Yes (partial)	Yes (partial)	Support found
P5	Proportion of F information in the mix of information strategic managers use is greater than the proportion of F information tactical and operational managers use	N/A	Yes (partial)	Yes	Support found
P6	Proportion of F information in the mix of information tactical managers use is greater than the proportion of F information operational managers use	N/A	Yes (partial)	No	Rejected
P7	Managers' perceived task-technology and its impact on the mix of information (Routine task => NF mix)	-	Yes	Yes	Support found
P8	Managers' perception of the performance indicators their superiors use to reward their performance and its impact on the mix of information (Financial performance indicators => F mix)	+	Yes	No	Support found
P9	Managers' organisation membership in Defender or Prospector firm and its impact on the mix of information (Defender => NF mix)	-	No	No	Rejected
P10	Total number of causal relationships between F and NF indicators and the manager's level of experience (Greater number of Causal relationships => less-experienced managers)	-	Yes	Yes	Support found
P11	Total number of causal relationships between F and NF indicators and its impact on the mix of information (Greater number => F mix)	+	Yes (weak)	Yes	Support found
P12	Total number of causal relationships and the managers' work complexity (High level of work complexity => greater number of causal links)	+	Yes	Yes (partial)	Support found

As shown in Table 20, the field results provided support for 8 of the 12 propositions developed in this thesis. No support was found for Proposition 1, 3, 6, and 9.

After controlling for the managers' functional areas, no qualitative support was found for Proposition 1 which argued that managers' perception of external environmental uncertainty would influence the nature of the mix of information they use for monitoring purposes. This suggests that the managers' functional area could act as a filtering mechanism reducing the individuals' exposure to external environmental uncertainty, and consequently, could influence their mix of information. For example, marketing managers who need to make predictions about the nature and level of customer demand for the organisation's products might face greater levels of perceived external uncertainty than production-operation managers who supply those products and services within operational settings that may remove managers to some extent from the external environment disturbance. This indirect relationship could explain the absence of clear patterns for the effects of perceived external environmental uncertainty on the mix of information used. In short, these results reinforce the importance of controlling for the managers' functional areas when conducting cross-functional field work.

The absence of support for Proposition 3 implies that the managers' perceptions of organisational centralisation does not influence the mix of information they use for monitoring purposes. These findings differ from the results of prior studies [e.g. Gul and Chia, 1994] which rely exclusively on top management perceptions to classify organisations in terms of structure and information use. The results reported here tend to suggest that even though top management may rely on specific performance indicators, their subordinates still make their own decisions about information use.

The field studies provide no support for Proposition 6 which argued that tactical and operational managers differ in the proportion of financial information they use. The quantitative results suggest that tactical and operational managers use a similar mix of information. Even though tactical managers may use additional financial information to monitor the achievement of the organisation's financial budget, the results revealed that they also relied on non-financial indicators that they perceived drove the organisation's results. This contradicts Anthony [1965] who suggested that tactical managers would tend to use a greater proportion of financial information than non-financial information in the mix of information they use. These results could suggest that the advent of new information processing technologies in organisations during the last thirty years may have made it easier to gather, process, and provide managers with the non-financial performance indicators they need to monitor the operations on a timely basis and predict future financial results. Overall, these results revealed the importance tactical managers attributed to the use of non-financial information in organisations for monitoring purposes.

The absence of support for Proposition 9 suggests that managers' membership in Defender or Prospector organisations does not influence the mix of information they use for monitoring purposes. Even though managers who worked in Defender and Prospector organisations appeared to differ in terms of experience backgrounds, there was no indication that these individual characteristics influenced their use of information. This absence of evidence suggests that the appropriateness of using Miles and Snow's taxonomy to discriminate between the managers' use of information still remains an open question.

Overall, these results suggest that the managers' functional area (production-operation, human resources, and marketing-sales), the managers' decision level (strategic, tactical, and operational), the managers' perception of task-technology (routine vs nonroutine), the managers' perception of the nature of performance indicators their superiors use to reward their performance, the managers' level of experience including their ability to perceive causal relationships between financial and non-financial indicators, all collectively influence the mix of information a manager uses for monitoring purposes. Interestingly, these results also revealed that Perrow's task-technology taxonomy may act as a proxy for the managers' decision levels and the complexity of their mental models in terms of selection of critical causal relationships between financial and non-financial performance indicators. These findings encourage the use of Perrow's taxonomy in empirical research and more in-depth studies of managers' task characteristics. The next chapter provides the conclusion of this thesis including a revised version of the model described in Figure 1 and the theoretical generalisations developed based on these field studies.

CHAPTER 5

MODEL REVISION AND CONCLUSION

5.1 INTRODUCTION

This chapter presents the revision of the model displayed in Figure 1 based on the study's results and proposes a set of 10 theoretical generalisations.⁷¹ The theoretical generalisations represent the extensions of repetitive patterns of evidence, that provide support for a set of theoretical propositions, into a theory attempting to explain a phenomenon [Yin, 1994]. This chapter also highlights the main contribution this thesis makes to the management accounting field and the limitations inherent in the method used. This chapter concludes with the directions for future research.

5.2 MODEL REVISION

The theory building mode of this thesis involves the revision of the preliminary model developed in Figure 1 based on the evidence gathered and the development of theoretical generalisations (also called analytical generalisations) as part of the theory that will be put to the test in future research. The results of the qualitative analyses

⁷¹ The numerical order of the revised propositions is unrelated to the order of the preliminary propositions stated earlier in Chapter 2.

supplemented by quantitative analyses of the data collected in 6 organisations from a total of 42 managers working in the production-operation, marketing-sales, and human resources areas at the strategic, tactical, and operational levels of management provided support for 8 of the 12 propositions as shown in Table 20 of Chapter 4. These field-survey findings led to the revised theoretical model presented in Figure 10.

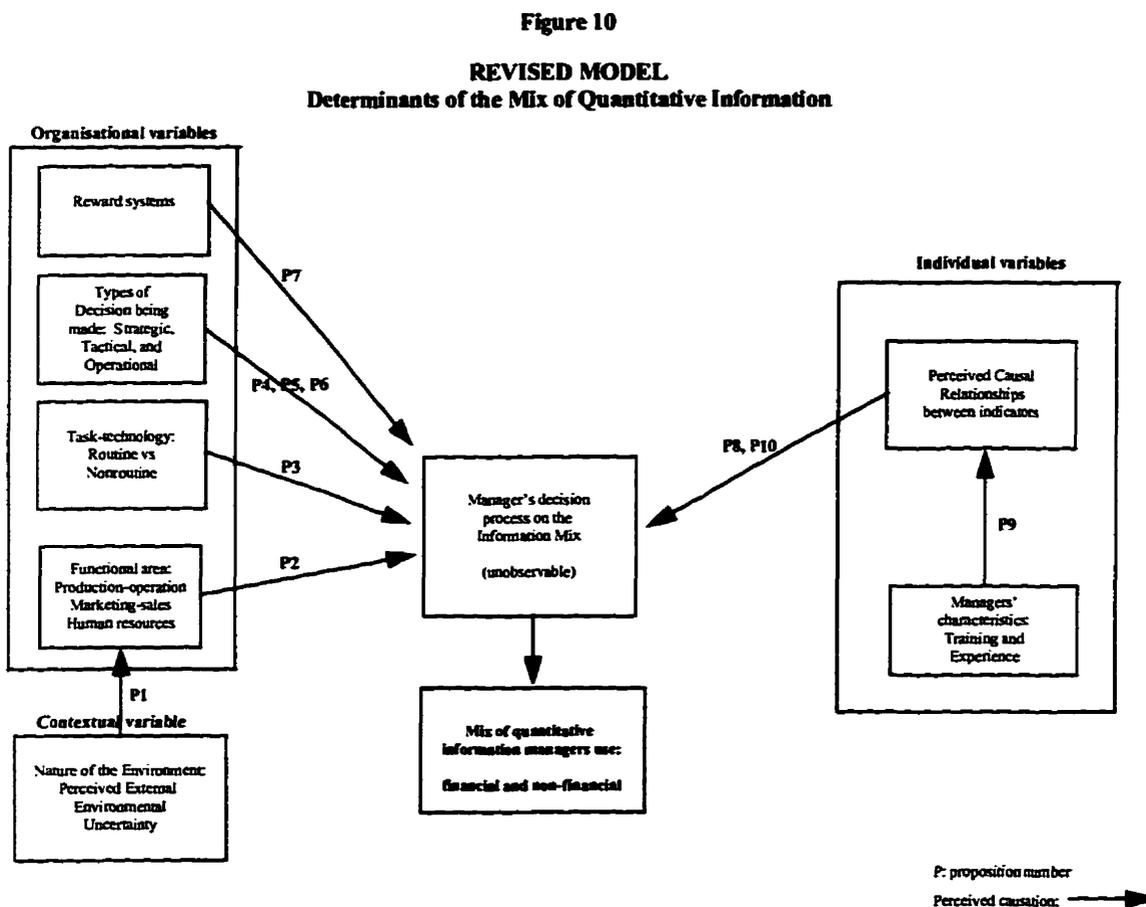


Figure 10 does not include the managers' perception of the degree of organisational centralisation and their membership in Defender or Prospector organisations (which were in Figure 1) because no support was found for the effect of these two variables on the mix

of information managers use. Alternatively, the results suggested that the manager's functional area influences the mix of information managers use in organisations. These are the main modifications made to the exploratory model shown in Figure 10. A total of seven factors, classified as contextual, organisational, and individual variables, collectively determine the mix of information managers use in organisations. These factors and their theoretical generalisations are as follows.

1. Managers' perceived external environmental uncertainty

Managers differ in the level of external uncertainty they perceive in their environment. Managers who are exposed to an organisational environment that is highly competitive and unstable, which makes it difficult to predict its future states, tend to perceive a greater level of external uncertainty. Alternatively managers who interact within a more friendly and stable organisational environment, which makes it easier to predict its future states, tend to perceive a lower level of external uncertainty. Managers may also be exposed to different levels of external uncertainty based on their functional role. For example, managers who deal directly with the organisation's external environment such as marketing-sales managers may perceive more external uncertainty than production-operation and human resources managers who work within the organisation's boundaries, thereby reducing their exposure to external uncertainty. In short, the managers' functional area could act as a filtering mechanism which could influence their exposure to external environmental uncertainty.

Although weak, the results suggest that managers who perceived a greater level of external environmental uncertainty tended to use a greater proportion of non-financial

information in their mix of information than managers who perceived a lower level of external environmental uncertainty. The managers' functional area seemed to reduce managers' exposure to external environmental uncertainty and thereby, influences the mix of information they use for monitoring purposes. Based on these results, Proposition 1 argues that:

P1: Managers who perceive a greater level of external environmental uncertainty due to their functional membership use a greater proportion of non-financial information in their mix of information than managers who perceive a lower level of external environmental uncertainty.

2. Managers' functional areas

The organisation's functional areas have different task characteristics that influence the nature of information managers require to accomplish their work. For example, production-operation managers often deal with issues related to physical production facilities and technical equipment or processes used to transform inputs into outputs. In this context, technical specifications often require the use of physical metrics expressed in non-financial terms such as the amount of electricity consumed or the functioning speed of various pieces of equipment. Alternatively, marketing-sales managers accomplish various tasks that consist of developing programmes to deliver the products or services customers want at the best selling prices possible that also maximise the organisation's value. Marketing-sales managers tend to monitor the achievement of the organisation's sales objectives in terms of financial metrics such as total sales, gross profit margins, or market share. In short, production-operation and marketing-sales managers could be pictured as the two extremes on the information-use continuum with production-operation managers

at the non-financial information end and marketing-sales managers at the financial information end of the continuum. Human resources managers rely on a mix of information that lies between these two extremes. Keeping close ties with other functional areas, human resources managers deal with financial issues such as employee rewards and other issues such as absenteeism, accidents, etc. often captured through non-financial indicators. Based on the characteristics of the manager's information menu, Proposition 2 suggests that:

P2: Managers' membership in a functional area influences the proportion of financial and non-financial information included in the mix of information they use.

3. Managers' perception of task-technology

The nature of the tasks managers perform in the organisation differs in terms of the level of task-analysability, i.e. the ability to divide a task into its mechanical steps, and in terms of variety, i.e. the number of exceptions a task involves. Based on these characteristics, a task can be classified as routine when it is highly analysable and repetitive. Alternatively, a task is considered nonroutine when it is unanalysable and involves many exceptions. The characteristics of the tasks managers perform also vary across the organisation's hierarchical levels. The field results suggest that managers who work at the strategic level perceive their job as more nonroutine than managers who work at the operational level. The analysability and variety of the tasks managers perform influence their ability to monitor their work processes as compared to their work output. The field results revealed that managers who perceived their work as routine tended to use a greater proportion of non-financial information in their mix of information than

managers who perceived their work as nonroutine. Based on this line of argument along with the field results Proposition 3 argues that:

P3: Managers who perceive their task-technology as routine use a greater proportion of non-financial information in their mix of information than managers who perceive their task-technology as nonroutine.

4. Managers' types of decisions

The nature of the decisions managers make in terms of complexity and time horizons vary across the organisation's hierarchical levels. The nature of the decisions managers make, captured by managers' hierarchical position, requires a specific mix of financial and non-financial information. According to Anthony's decision typology, strategic managers deal with longer term horizon decisions than operational managers who make shorter term horizon decisions. Tactical managers lie between these two extremes and make mid-term horizon decisions.

The field results indicated that strategic production-operation and human resources managers (also called throughput managers) tended to use a mix of information that included a greater proportion of financial information than tactical and operational throughput managers. Moreover, the field results also revealed that the proportion of non-financial information included in the mix of information of throughput managers was greater than the proportion of financial information. However, marketing-sales managers (also called output managers), who dealt with customer-related issues often expressed in financial terms, all tended to use more financial information than non-financial information.

Based on the field results Proposition 4, 5, and 6 are stated as follows.

- P4: Strategic, tactical, and operational throughput managers use more non-financial information than financial information.**
- P5: Strategic throughput managers use more financial information in their mix of information than tactical and operational throughput managers.**
- P6: Strategic, tactical, and operational output managers use more financial information in their mix of information than non-financial information.**

5. Managers' perception of reward systems

Organisations develop reward systems to motivate employees and to encourage subordinates to exert the level of effort or behaviour organisations want. To achieve this objective, managers must perceive that their level of reward is contingent on attaining a specific level of output. This process of rewarding managers using their level of performance implies that either the output or the process used to deliver the desired level of output is measurable. Since the nature of the work managers perform varies across functional areas and in terms of analysability and variety, reward systems tend to rely on performance indicators that capture the characteristics of managers' functional work in order to correctly assess their level of effort and to reward their performance. Managers who believed that their reward was tied to how well they did based on the indicators they used for monitoring their work performance tended to direct their attention toward the performance indicators that drove their reward.

Based on the field results which provide support for this line of argument, Proposition 7 argues that:

P7: Managers, who perceive that non-financial performance indicators drive their level of reward, will use a greater proportion of non-financial information in their mix of information than managers who perceive that financial performance indicators drive their level of reward.

6. Managers' level of experience and perceived causal relationships

The field results revealed that managers differ in terms of their level of experience and backgrounds. Managers also differed in terms of perceptions they had of their work complexity along the same lines as routine or nonroutine tasks. The judgement and decision-making literature suggests that managers organise their world and work perceptions in terms of mental representations depicted as a set of cause-effect relationships between phenomena which vary in terms of the number of cause-effect links with the complexity of their environment as they see it [e.g. Calori et al. 1994]. Providing support for this line of argument, the field results suggest that managers who performed complex (nonroutine) tasks developed a more complex mental model of their work (i.e. including a greater number of critical causal relationships) than managers who undertook more simple (routine) tasks.

Along with their perceptions of causal relationships between phenomena that occur in their work, managers also perceive causal relationships between performance indicators that vary according to their level of experience. The field results revealed that experienced managers often used a reduced set of leading indicators, generally non-financial, to monitor and predict the achievement of the organisation's financial results. This implies

that as managers gain experience, they tend to focus on a smaller number of critical causal relationships between financial and non-financial performance indicators to monitor the organisation's processes compared to less-experienced managers who are less able to focus on the most relevant subset in cause-effect relationships they monitor. Since experienced managers tended to focus on leading and critical non-financial information, their mix of information included a greater proportion of non-financial information than managers who focused on a greater number of causal relationships between indicators and who used a greater proportion of financial information in their mix of information. Based on the support found in the field for this line of argument, Proposition 8, 9, and 10 are stated as follows.

- P8: Managers who execute complex tasks develop a more complex mental model of their work than managers who perform simple tasks.**
- P9: Experienced managers select a smaller number of critical causal relationships between non-financial and financial indicators than less-experienced managers.**
- P10: Managers who focus on a smaller number of causal relationships between non-financial and financial indicators use a greater proportion of non-financial information in their mix of information than managers who focus on a greater number of cause-effect relationships.**

5.2.1 Summary

The theoretical model described in Figure 10 and its set of analytical generalisations developed based on the field study results constitute the first step in developing a theory of the information choices in organisations. These theoretical generalisations will be put to the test in future research.

5.3 CONTRIBUTION OF THIS THESIS

This thesis makes several contributions to the management accounting discipline. The main contribution of this thesis is to develop a theoretical model of the factors that influence the manager's choice of quantitative financial and quantitative non-financial information for monitoring purposes. In bringing together the various bodies of literature in judgement and decision-making, management accounting, organisations, and management, this thesis provides an integrative view that helps to better understand the factors that collectively determine the mix of information managers use for monitoring purposes.

Furthermore, the development of an integrative model and its related theoretical generalisations in this thesis provides the opportunity to further test on a large scale this new model of information choices in organisations. Future intensive testing of this model could improve its robustness and provide the management accounting discipline with its own theory of information choice in organisations.

Moreover, this thesis innovates by introducing and testing with 42 managers the concept of causal relationships managers perceive between non-financial and financial performance indicators. This concept of cause-effect relationship provides potential explanations for why managers may tend to focus on leading non-financial indicators such as the number of units produced, the level of raw materials overuse, etc. to monitor and predict the achievement of the organisation's financial results. The support found in the study for this concept reinforces the importance of individuals' perceptions in determining the mix of information managers use in organisational settings. Similar to Lebas' [1995]

illustration of the fruit tree, this concept of perceived causal relationship provides further support for the use of leading non-financial indicators that are tied to the organisation's main processes to monitor and predict the achievement of the organisation's financial results.

In addition, this thesis brings a more current view of the nature of the information managers use in organisations and provides support for the Nanni et al. [1990] evidence of the importance of non-financial information in the managers' information menu. In short, the results revealed that more than 50 % of the information production-operation and human resources managers use in organisations is non-financial in nature. As shown in Section 4.3.4 of this thesis, this result could foster future research leading management accounting academics to further investigate the characteristics of non-financial information that appeal to managers who rely heavily on it. This could help to better understand the trade-offs between the use of financial and non-financial information for monitoring and decision-making purposes in organisations.

The development of a model integrating the determinants of the managers' information choices in organisation could also have a major implication for practice. Understanding the factors that determine the managers' information use could help information system practitioners to develop information systems that better meet managers' needs for financial and non-financial information for monitoring purposes in organisations. The development of such information systems could also be viewed as a training tool helping managers to learn about the organisation's critical processes through the availability of the non-financial indicators that capture those processes.

Moreover, the development of a model that integrates the determinants of the managers' information choices in organisations could also have some implications for education. It could help students to understand the complexity of the quantitative information environment in organisations and the relationships among the determinants of the manager's mix of information. Furthermore, the diversity of the performance measures gathered throughout this dissertation may improve future accountants' exposure to the richness of the quantitative information used in organisations.

Lastly, this thesis also contributes to the management accounting discipline through the development of new research instruments used to capture the richness of the managers' mix of information and their perceptions of causal relationships between financial and non-financial indicators. Along with the development of a clear definition of non-financial information and the identification of the managers' perceptions of task-technology to potentially act as a proxy for the managers' hierarchical level or types of decisions they make and for the complexity of the managers' task-related mental models, these new instruments could support future research efforts leading to the improvement of those tools.

5.4 LIMITATIONS OF THIS STUDY

As in any type of research, there are a number of limitations to take into account when interpreting the results. First, this thesis relies on the “deliberate sampling for heterogeneity” recommended in Cook and Campbell [1979] to gather information using a field-survey method from a small and balanced sample between Defender and Prospector firms for a total of six organisations. A total of 42 managers participated in this study and were drawn from three functional areas and levels of management. This sampling approach created variance in the sample of managers and provided the external validity required in field research in developing theoretical generalisations to specific target populations of managers, although the small sample reduced the external validity of these results.

It should be remembered that theoretical or analytical generalisations are developed in this study and not statistical generalisations as is the case in large-scale surveys or archival research. Since this thesis relies on analytical generalisations to develop a theory of information choices in organisations based on the patterns that emerged from the field, no statistical generalisations can be made here. Only the replication in future research of the same results as predicted by the theoretical generalisations will provide sufficient tests for the robustness of the theory developed in this thesis.

The main threat to internal validity in this thesis is the inference of causal relationships and the direction of causality between factors which could also vary across organisational contexts. Since the nature of the field work does not allow to manipulate

and control for the interference caused by other factors as is the case in a laboratory setting, it is possible that a third and omitted variable might drive the patterns of results observed during the field studies. The use of six organisations in this thesis allowed for the triangulation of the patterns observed among managers in one organisation against others working in the other organisations reducing the possibility of not detecting important omitted variables causing the patterns observed in the field-study research. Even though this pattern-matching technique helps to strengthen the internal validity of the results, it cannot rule out the possibility that omitted variables may exist and were not detected during the interviews [Yin, 1994].

Possible threats to construct validity such as hypothesis guessing during the interview or when answering the questionnaire (including the manager's evaluation apprehension effect) were minimised by emphasising that this study focused on learning about the phenomenon of information use as opposed to proving or disproving a specific theory or point of view. This was made clear at the beginning of the interview. However, no guarantee can be provided that a limited number of managers did not behave along those lines.

Even though managers and organisations who were asked to participate in the study had to meet specific characteristics, the self-selection bias related to firms and to volunteers within those firms cannot be ruled out in this study. Although this threat to external validity still exists, there was no evidence suggesting that the sample of organisations and managers who participated in this research did not conform with the characteristics of the population of managers and organisations who work and operate in the Province of Québec.

5.5 DIRECTIONS FOR FUTURE RESEARCH

In this section of the thesis, four directions for future research are discussed. First, the development of theoretical generalisations based on the integrative model of information choice in organisations could be tested using large scale surveys. Explanatory field studies could also be conducted in organisations to further test the model developed through this thesis. These future tests could support the model revision process in developing a robust theory of information choice.

Second, laboratory experiments could be developed by bringing experienced and less-experienced managers into a controlled environment where the effects of various scenarios on the mix of information could be used to specifically test managers' perception of causal relationships between financial and non-financial indicators. Since a similar approach has been used in the auditing context [e.g. Bonner, 1990], the development of various scenarios would allow for a test of the nature of the causal relationships managers use to select performance indicators.

Third, applications of managers' use of non-financial information could be studied in an auditing context to investigate how different levels of experienced auditors rely on the organisation's non-financial performance indicators to direct their investigation. It would be interesting to investigate the auditors' information choice process between similar level of verifiability of financial and non-financial indicators and how they perceive the role of either types of information in issuing the audit report.

Last, building on a better understanding of the factors that determine the mix of quantitative information managers use, future studies may also investigate the nature of

the trade-offs between the use of quantitative and qualitative information (for example, the trade-off between the use of the number of employee accidents vs the evaluation of compliance with employee safety programmes). Relying on the revised model proposed by this thesis, possible extensions could include the study of the determinants of the mix of qualitative information managers use in organisations. Since the use of qualitative information may also represent an important proportion of all the information managers use in organisations as Mintzberg [1973] suggested, the revised model of the determinants of quantitative information use could be the first important step made in this thesis by developing a global theory in management accounting of the information choices in organisations.

In summary, the revised model of the information choices which integrates diverse bodies of literatures and proposes a set of 10 theoretical generalisations constitutes the main results of this thesis. The partial and preliminary evidence of the importance of the use of non-financial information in organisations reinforces the need for more in-depth studies of this phenomenon. Future research could help by providing a better understanding of the trade-offs between the use of financial and non-financial information. As suggested by Johnson and Kaplan [1987], more in-depth research on the use of non-financial information in organisations could help the management accounting discipline to regain some of its “relevance lost” over the past seventy years by focusing too heavily on the use of financial information for monitoring and decision-making purposes. In short, this thesis could represent one step toward the recognition of the importance of the non-financial information in the managers’ information menu and to regain some of the “relevance lost” in management accounting.

APPENDIX A
QUESTIONNAIRE

MIX OF QUANTITATIVE FINANCIAL AND QUANTITATIVE NONFINANCIAL INFORMATION USED IN ORGANISATIONS

This survey includes a list of questions to capture your organisational and information environment. The mix of quantitative financial and quantitative nonfinancial information managers use, for example, the cost per unit of a product and the number of employee hours, still remains an unsettled issue in organisational research. Moreover, quantitative nonfinancial information such as the number of daily units produced, the percentage of defects or scrapped units produced, and the rate of equipment or labour used, is almost avoided in teaching the management accounting discipline.

This survey will shed light on the components of the mix of quantitative information you use in your organisation. I would appreciate it very much if you would take 75 minutes of your time to complete this important survey. Your participation in this study is critical to the success of this research investigating the factors or circumstances that determine the mix of quantitative information you generally use in your organisation for monitoring and decision-making purposes.

Each section of this questionnaire pursues a specific objective. For the validity of this survey, it is very important that you answer all the questions in the way that best describes your work conditions and your organisation's environment. All the information gathered through this questionnaire will be held strictly confidential.

Please, do not hesitate to provide any comments you have or to qualify your answers by using the space in the margins. Your comments will be read and taken into consideration in the final analysis.

Sincere thanks for you helpful collaboration.

Raymond Morissette
Ph.D Candidate
School of Accountancy
University of Waterloo
200 University Avenue West
Waterloo, Ontario
N2L 4N3

Phone: 1-418-656-2487
fax: 1-418-656-2624

1- Characteristics of your job or duties

The purpose of this section is to identify the nature of the work or duties you perform in your organisation. Please rate the extent to which the following characteristics generally describe the nature of your work/duties:

	To a Small Extent			To a Great Extent			
1. To what extent would you say your work is routine?.....	1	2	3	4	5	6	7
2. People in your unit do the same job in the same way most of the time.....	1	2	3	4	5	6	7
3. Basically, unit members perform repetitive activities in doing their jobs.....	1	2	3	4	5	6	7
4. To what extent is there a clearly known best way to do the major types of work you normally encounter?.....	1	2	3	4	5	6	7
5. To what extent is there an understandable sequence of steps that can be followed in doing your work?.....	1	2	3	4	5	6	7
6. To do your work, to what extent can you actually rely on established procedures and practices?.....	1	2	3	4	5	6	7

2- Decentralisation

The purpose of this section is to determine at which level of the organisation are the decisions related to your unit, department, plant, division, or organisation made. Based on your job responsibility and knowledge of your organisation, please indicate on a scale of 1 to 5 which lowest level of management has the authority to make a decision in each of the following decisions:

The scale of 1 to 5 corresponds to the levels of the organisation from the lowest level to the highest level:

- 1 represents a "unit or team decision"
- 2 represents a "departmental decision"
- 3 represents a "plant decision"
- 4 represents a "divisional decision"
- 5 represents a "head office or corporate decision"

	Unit Decision					Higher level of Management Decision				
	1	2	3	4	5	1	2	3	4	5
1. The appointment of supervisory staff.....	1	2	3	4	5	1	2	3	4	5
2. Promotion of staff.....	1	2	3	4	5	1	2	3	4	5
3. Dismissal of staff.....	1	2	3	4	5	1	2	3	4	5
4. Spending unbudgeted money on capital or revenue items.....	1	2	3	4	5	1	2	3	4	5
5. Determining type or brand of new equipment.....	1	2	3	4	5	1	2	3	4	5
6. Introducing a new product/brand/service.....	1	2	3	4	5	1	2	3	4	5
7. Determining marketing territories to be covered.....	1	2	3	4	5	1	2	3	4	5
8. Determining what should be inspected.....	1	2	3	4	5	1	2	3	4	5
9. Determining what should be "the work to be studied"	1	2	3	4	5	1	2	3	4	5
10. Determining which supplier is to be used.....	1	2	3	4	5	1	2	3	4	5
11. Determining which training methods are to be adopted.....	1	2	3	4	5	1	2	3	4	5
12. Pricing the product/service or output.....	1	2	3	4	5	1	2	3	4	5
13. Creating a new job within your unit.....	1	2	3	4	5	1	2	3	4	5
14. Making a change in your unit's organisational setting, e.g. combining two major subunits.....	1	2	3	4	5	1	2	3	4	5

	Question 1					Question 2
	Never	INFORMATION USED				Link with the financial results
	Daily	Weekly	Monthly	Quarterly	Yearly	
13. Account receivable turnover (<i>F</i>)	_____	_____	_____	_____	_____	_____
14. Market share (<i>F</i>)	_____	_____	_____	_____	_____	_____
15. Total sales per sales representative (<i>F</i>)	_____	_____	_____	_____	_____	_____
16. Average sales order (<i>F</i>)	_____	_____	_____	_____	_____	_____
17. Total sales per region (<i>F</i>)	_____	_____	_____	_____	_____	_____
18. Total sales or revenues (<i>F</i>)	_____	_____	_____	_____	_____	_____
19. Gross profit margin (<i>F</i>)	_____	_____	_____	_____	_____	_____
20. Number of new products (<i>NF</i>)	_____	_____	_____	_____	_____	_____
21. Rate of introduction of new products (<i>NF</i>)	_____	_____	_____	_____	_____	_____
22. Number of lines of products (<i>NF</i>)	_____	_____	_____	_____	_____	_____
23. Number of removed products (<i>NF</i>)	_____	_____	_____	_____	_____	_____
24. Rate of products removal (<i>NF</i>)	_____	_____	_____	_____	_____	_____
25. Inventories available expressed in units						
a) raw materials (<i>NF</i>)	_____	_____	_____	_____	_____	_____
b) semi-finished products (<i>NF</i>)	_____	_____	_____	_____	_____	_____
c) finished products (<i>NF</i>)	_____	_____	_____	_____	_____	_____
26. Inventories turnover ratio (<i>F</i>)	_____	_____	_____	_____	_____	_____
27. Inventories available expressed in dollars						
a) raw materials (<i>F</i>)	_____	_____	_____	_____	_____	_____
b) semi-finished products (<i>F</i>)	_____	_____	_____	_____	_____	_____
c) finished products (<i>F</i>)	_____	_____	_____	_____	_____	_____
28. Number of machine or plant hours used (<i>NF</i>)	_____	_____	_____	_____	_____	_____
29. Rate of production capacity or resources used (<i>NF</i>)	_____	_____	_____	_____	_____	_____
30. Number and length of down time (<i>NF</i>)	_____	_____	_____	_____	_____	_____
31. Number of new employees (<i>NF</i>)	_____	_____	_____	_____	_____	_____
32. Number of employee hours (<i>NF</i>)	_____	_____	_____	_____	_____	_____
33. Number of employee hours per shift (<i>NF</i>)	_____	_____	_____	_____	_____	_____
34. Number of worker injuries (<i>NF</i>)	_____	_____	_____	_____	_____	_____
35. Rate of incidence of injuries (<i>NF</i>)	_____	_____	_____	_____	_____	_____
36. Level of absenteeism (e.g. hours, employee, or %) (<i>NF</i>)	_____	_____	_____	_____	_____	_____
37. Number of grievances received (<i>NF</i>)	_____	_____	_____	_____	_____	_____
38. Number of grievances resolved (<i>NF</i>)	_____	_____	_____	_____	_____	_____
39. Number of units produced (<i>NF</i>)	_____	_____	_____	_____	_____	_____
40. Rate of incidence of production or service defect (<i>NF</i>)	_____	_____	_____	_____	_____	_____
41. Amount of material scrap produced (<i>NF</i>)	_____	_____	_____	_____	_____	_____

Please identify any other important omitted indicators that you use and answer the same questions as above.

	Question 1					Question 2
	INFORMATION USED					Link with
	Daily	Weekly	Monthly	Quarterly	Yearly	the financial results
71. _____	_____	_____	_____	_____	_____	_____
72. _____	_____	_____	_____	_____	_____	_____
73. _____	_____	_____	_____	_____	_____	_____
74. _____	_____	_____	_____	_____	_____	_____
75. _____	_____	_____	_____	_____	_____	_____
76. _____	_____	_____	_____	_____	_____	_____
77. _____	_____	_____	_____	_____	_____	_____
78. _____	_____	_____	_____	_____	_____	_____
79. _____	_____	_____	_____	_____	_____	_____
80. _____	_____	_____	_____	_____	_____	_____
81. _____	_____	_____	_____	_____	_____	_____
82. _____	_____	_____	_____	_____	_____	_____
83. _____	_____	_____	_____	_____	_____	_____
84. _____	_____	_____	_____	_____	_____	_____
85. _____	_____	_____	_____	_____	_____	_____
86. _____	_____	_____	_____	_____	_____	_____
87. _____	_____	_____	_____	_____	_____	_____
88. _____	_____	_____	_____	_____	_____	_____
89. _____	_____	_____	_____	_____	_____	_____
90. _____	_____	_____	_____	_____	_____	_____

3. Based on the measures listed on page 3 to 6, including any measures you added to the list, please indicate, if any, the number of the **5 most important measures** that you use on a daily, weekly, monthly, quarterly, and yearly basis. Please write the number of the item in the space provided.

	Daily	Weekly	Monthly	Quarterly	Yearly
1. First most important measure	_____	_____	_____	_____	_____
2. Second most important measure	_____	_____	_____	_____	_____
3. Third most important measure	_____	_____	_____	_____	_____
4. Forth most important measure	_____	_____	_____	_____	_____
5. Fifth most important measure	_____	_____	_____	_____	_____

4- Nature of the reward system

The purpose of this section is to identify the nature of the reward system that is used to assess and reward your performance. Please indicate the extent to which the following describe the nature of the reward systems used to determine your reward.

	Strongly Disagree						Strongly Agree
1. My superior's evaluation of my level of performance depends on pre-established:							
a) quantitative nonfinancial performance measures (e.g., number of unit produced, number of hours worked, level of scrap produced, etc.).....	1	2	3	4	5	6	7
b) quantitative financial performance measures (e.g., meeting my financial budget, financial ratios, cost per unit, etc.).....	1	2	3	4	5	6	7
2. My pay depends on my results measures based on objective performance measures.....	1	2	3	4	5	6	7
3. My pay depends on how well my unit achieves its financial objectives.....	1	2	3	4	5	6	7
4. My pay depends mainly on my superior's perception of how well I am doing my work and interacting with others.....	1	2	3	4	5	6	7
5. Periodically, I am given access to the records of my results measures.....	1	2	3	4	5	6	7
6. I personally keep records of my results measures.....	1	2	3	4	5	6	7

7. According to the list of measures provided on pages 3 to 6 including those you added to the list on page 6, please indicate the item number of the **5 most important measures or indicators** you think your superior uses to assess your performance and to determine your reward. In the case where the measures used to assess your performance do not appear on this list, please write a description in the space provided.

The most important indicators or measures of my performance are:

- | | Write the item number |
|----------------------------------|-----------------------|
| 1. First most important measure | _____ |
| 2. Second most important measure | _____ |
| 3. Third most important measure | _____ |
| 4. Forth most important measure | _____ |
| 5. Fifth most important measure | _____ |

5- Nature of your organisation's strategy

The purpose of this section is to identify the nature of your organisation's strategy, i.e. the pattern of behaviour or actions that your organisation uses to interact within its industry or sectors of activities. Given the two following descriptions of strategy, please indicate which category best describes your organisation at this time. (Please consider your plant, division or organisation as a whole and note that neither is inherently "good" or "bad")

" Company A maintains a "niche" in a market by offering a relatively stable set of products/ services. Generally, Company A is not at the forefront of new products, services or market developments in its field. Company A tends to ignore changes that have no direct impact on current areas of operation and it concentrates instead on doing the best possible job in its existing field."

" Company B makes relatively frequent changes in its set of products/services. Company B consistently attempts to pioneer and innovate in new areas of market activities, even if not all of these efforts ultimately prove to be highly successful. Company B responds rapidly to early signals of market needs or opportunities."

1. Please indicate which of these two descriptions best represents your organisation.

My organisation is best described by:

Company "A" or Company "B"

6- Nature of your organisation's external environment

The relationships that your company has with various sectors of the external environment such as suppliers, customers, financial institutions, governments and labour unions may be very important for your organisation. Specifically, I would like you to rate the characteristics or behaviour of various sectors on the degree of their predictability, where 1 = highly predictable and 7 = highly unpredictable or n/a = not applicable. Please rate the extent to which the following best describe your ability to predict the conditions of your external environment.

		<u>Predictable</u>	<u>Unpredictable</u>						
1. Suppliers of your raw materials (services), components, and subcontractors:									
a.	their price changes are.....	n/a	1	2	3	4	5	6	7
b.	their quality changes are.....	n/a	1	2	3	4	5	6	7
c.	their design changes are.....	n/a	1	2	3	4	5	6	7
d.	the introduction of new materials or components is..	n/a	1	2	3	4	5	6	7
2. Competitor's actions:									
a.	their prices changes are.....	n/a	1	2	3	4	5	6	7
b.	their product quality changes are.....	n/a	1	2	3	4	5	6	7
c.	their product design changes are.....	n/a	1	2	3	4	5	6	7
d.	the introduction of new products is.....	n/a	1	2	3	4	5	6	7
3. Customers:									
a.	their demand for existing products is.....	n/a	1	2	3	4	5	6	7
b.	their demand for new products is.....	n/a	1	2	3	4	5	6	7
4. The financial/capital market:									
a. interest rate changes:									
1.	short-term debt are	n/a	1	2	3	4	5	6	7
2.	long-term debt are.....	n/a	1	2	3	4	5	6	7
b. changes in financial instruments available:									
1.	short-term debt are.....	n/a	1	2	3	4	5	6	7
2.	long-term debt are.....	n/a	1	2	3	4	5	6	7
c. changes in availability of credit:									
1.	short-term debt are.....	n/a	1	2	3	4	5	6	7
2.	long-term debt are.....	n/a	1	2	3	4	5	6	7

		<u>Predictable</u>	<u>Unpredictable</u>					
5. Government regulatory agencies:								
a. changes in laws or agencies policies on pricing are.....	n/a	1	2	3	4	5	6	7
b. changes in laws or policies on product standards or quality are.....	n/a	1	2	3	4	5	6	7
c. changes in laws and policies regarding financial practices are.....	n/a	1	2	3	4	5	6	7
d. changes in labour (personnel) laws or policies are....	n/a	1	2	3	4	5	6	7
e. changes in laws or policies affecting marketing and distribution methods are.....	n/a	1	2	3	4	5	6	7
f. changes in laws or policies on acceptable accounting procedures are.....	n/a	1	2	3	4	5	6	7
6. Actions of labour unions:								
a. changes in wages, hours, and working conditions are.....	n/a	1	2	3	4	5	6	7
b. changes in union security are.....	n/a	1	2	3	4	5	6	7
c. changes in grievance procedures are.....	n/a	1	2	3	4	5	6	7

7- Demographic statistics

The purpose of this section is to obtain some descriptive information about your education, experience, and tenure in your current organisation and in previous organisations.

1. Please indicate with a "X" the type of degree(s) obtained and write the item number corresponding to the discipline studied as described below:

Degree	Degree obtained	Discipline
1. High school	_____	n/a
2. College	_____	_____
3. Undergraduate certificate	_____	_____
4. Bachelor's degree	_____	_____
5. Master's degree	_____	_____
6. Doctoral degree	_____	_____

Discipline(s) studied:

1. Accounting/finance
2. Marketing/sales
3. Business/management/human resources
4. Economics
5. Engineering (applied sciences)
6. Pure sciences
7. Health sciences
8. Social sciences (e.g. psychology, philosophy, languages, law, geography, etc.)
9. Others (specify..)
 - a) _____
 - b) _____
 - c) _____
 - d) _____

If you do not have more than one degree of the same type, for example, 2 bachelor's degrees, go to question 4 on the next page.

2. If you have obtained more than one degree of the same type, for example, 2 bachelor's degrees, please specify the nature of the degree obtained and the item number corresponding to the discipline studied as described above.

Type of degree	Discipline
a) _____	_____
b) _____	_____
c) _____	_____
d) _____	_____

If you are not actually pursuing or have not interrupted your studies that lead to a degree, go to question 4 on the next page.

3. If you are actually pursuing or have interrupted your studies that lead to a degree, please indicate: the type of degree that you will get or would have got, the item number of the discipline studied, and the number of years completed corresponding to the normal duration of a full-time regime of studies.

Type of degree	Discipline	Number of years completed
a) _____	_____	_____
b) _____	_____	_____
c) _____	_____	_____
d) _____	_____	_____

4. Indicate the number of years and the type of experience you have in:

- 1) your current functional position
- 2) your prior functional positions occupied in your organisation
- 3) your prior functional positions occupied in other organisations

	1) Current Functional <u>Position</u> Years of Experience in that Position in your <u>Organisation</u>	2) Prior Functional <u>Positions</u> Years of Experience in those Positions in your <u>Organisation</u>	3) Prior Functional <u>Positions</u> Years of Experience in those Positions in other <u>Organisations</u>
1. Accounting.....	_____	_____	_____
2. Finance and treasury.....	_____	_____	_____
3. Information systems.....	_____	_____	_____
4. Marketing.....	_____	_____	_____
5. Personnel.....	_____	_____	_____
6. Legal counsel.....	_____	_____	_____
7. Production and operations.....	_____	_____	_____
8. Research and development.....	_____	_____	_____
9. Other Specified: _____	_____	_____	_____

5. Title of your current functional position is: _____

6. Your professional designation(s) :

Please specify: a) _____
b) _____
c) _____
d) _____

7. Your age: _____ 20 - 29
 _____ 30 - 39
 _____ 40 - 49
 _____ 50 - 59
 _____ 60 - +

Sincere thanks for your participation in this study

QUESTIONNAIRE
(FRENCH VERSION)

**MIXTE DE L'INFORMATION
QUANTITATIVE FINANCIÈRE ET QUANTITATIVE NON FINANCIÈRE
UTILISÉE DANS L'ORGANISATION**

Ce sondage consiste en une série de questions visant à définir l'environnement organisationnel et informationnel dans lequel vous vous situez. Le mixte d'informations quantitatives, financières et non financières, par exemple, le coût unitaire d'un produit et le nombre d'heures de main-d'oeuvre, que les gestionnaires utilisent, demeure encore un domaine très peu exploré en théorie organisationnelle. De fait, l'information quantitative non financière, par exemple, le nombre de produits fabriqués par jour, le pourcentage de produits gâchés ou rejetés, les facteurs d'utilisation de l'équipement ou de la main-d'oeuvre, est presque entièrement ignorée dans l'enseignement de la comptabilité de gestion.

Ce sondage vise donc à faire la lumière sur les composantes du mixte d'informations quantitatives que vous utilisez dans votre organisation. J'apprécieraï grandement que vous m'accordiez environ 75 minutes de votre temps pour compléter ce questionnaire. Votre participation à ce sondage s'avère primordiale pour l'avancement de la connaissance visant l'identification des circonstances ou des facteurs déterminant le mixte d'informations quantitatives que vous utilisez dans le cours normal de vos activités de contrôle et de prises de décisions.

Chaque groupe de questions poursuit un objectif particulier. Il est très important, pour la validité de ce sondage, que vous répondiez à toutes les questions et que vous fournissiez la réponse qui décrit le mieux votre situation ou les conditions actuelles caractérisant votre travail, de même que votre organisation.

Je tiens à préciser que toute l'information recueillie par le biais de ce questionnaire demeurera strictement confidentielle. De plus, si vous désirez faire des commentaires sur une ou plusieurs questions ou préciser vos réponses, utilisez l'espace dans les marges. Vos commentaires seront lus et pris en considération.

Je vous remercie à l'avance pour votre sincère collaboration.

Raymond Morissette ca, cma

School of Accountancy
University of Waterloo
200, University Avenue West
Waterloo, Ontario
N2L 3G1

Tél.: 1-418-656-2487
Fax: 1-418-656-2624

1- Caractéristiques de votre travail ou fonction

L'objectif poursuivi dans cette section est de déterminer les caractéristiques de votre travail ou de la fonction que vous exercez au sein de votre organisation. Pourriez-vous identifier dans quelle mesure les caractéristiques suivantes correspondent, de façon générale, à votre travail ou fonction?

	Dans une faible mesure			Dans une large mesure			
1. Dans quelle mesure diriez-vous que votre travail est routinier?.....	1	2	3	4	5	6	7
2. Les membres de votre groupe de travail accomplissent la plupart du temps leurs tâches de la même manière.....	1	2	3	4	5	6	7
3. En fait, les membres de mon groupe de travail accomplissent des opérations ou activités répétitives dans l'exécution de leur travail.....	1	2	3	4	5	6	7
4. Dans quelle mesure existe-t-il une approche ou façon clairement définie pour accomplir les principaux types d'opérations ou d'activités que vous rencontrez dans l'exécution de votre travail ou fonction?.....	1	2	3	4	5	6	7
5. Dans quelle mesure existe-t-il une suite logique d'étapes ou d'opérations compréhensibles qui peuvent être suivies pour effectuer votre travail?.....	1	2	3	4	5	6	7
6. Dans l'exécution de votre travail, dans quelle mesure pouvez-vous compter sur des procédures ou pratiques clairement définies et établies?.....	1	2	3	4	5	6	7

2- Décentralisation

L'objectif poursuivi dans cette section est de déterminer à quel niveau organisationnel sont prises les décisions touchant votre groupe de travail, département, usine, division ou organisation. En vous référant au niveau de responsabilités que vous confère votre travail ou votre fonction, et au meilleur de votre connaissance, indiquez sur une échelle de 1 à 5 le niveau hiérarchique le moins élevé qui a l'autorité nécessaire pour prendre les décisions décrites ci-dessous:

L'échelle de 1 à 5 correspond aux niveaux hiérarchiques allant du niveau le moins élevé au niveau le plus élevé:

- 1 décision du "groupe de travail"
- 2 décision du "département"
- 3 décision de "l'usine"
- 4 décision de la "division"
- 5 décision du "siège social ou prise au niveau corporatif"

	Décision du groupe de travail		Décision corporative		
1. Engagement de personnel de supervision.....	1	2	3	4	5
2. Promotion de personnel.....	1	2	3	4	5
3. Congédiement de personnel.....	1	2	3	4	5
4. Dépenses en capital ou de fonctionnement non budgétisées.....	1	2	3	4	5
5. Choix des caractéristiques ou de la marque de commerce de nouveaux équipements.....	1	2	3	4	5
6. Introduction de nouveaux produits/marques de commerce/services.....	1	2	3	4	5
7. Identification des territoires de ventes à desservir.....	1	2	3	4	5
8. Identification de ce qui doit être inspecté.....	1	2	3	4	5
9. Identification des tâches ou procédés qui doivent être analysés.....	1	2	3	4	5
10. Choix des fournisseurs/sous-traitants à être utilisés....	1	2	3	4	5
11. Établissement des programmes de formation des employés à être utilisés.....	1	2	3	4	5
12. Détermination du prix des produits/services.....	1	2	3	4	5
13. Établissement d'une nouvelle fonction ou tâche de travail au sein de votre groupe de travail.....	1	2	3	4	5
14. Modifications dans le fonctionnement ou structure de votre groupe de travail, département, etc. (ex.: regroupement d'importantes unités de travail)...	1	2	3	4	5

	-----Question 1-----					-Question 2- Lien avec les résultats financiers
	<u>Jamais</u>	INDICATEURS UTILISÉS				
	<u>Jour</u>	<u>Semaine</u>	<u>Mois</u>	<u>Trimestre</u>	<u>Année</u>	
11. Total des ventes par employé	_____	_____	_____	_____	_____	_____
12. Nombre de comptes clients en souffrance	_____	_____	_____	_____	_____	_____
13. Ratio de recouvrement des comptes clients	_____	_____	_____	_____	_____	_____
14. Part de marché	_____	_____	_____	_____	_____	_____
15. Total des ventes par représentant	_____	_____	_____	_____	_____	_____
16. Ventes moyennes par commande	_____	_____	_____	_____	_____	_____
17. Total des ventes par région ou territoire de ventes	_____	_____	_____	_____	_____	_____
18. Total des ventes (revenus)	_____	_____	_____	_____	_____	_____
19. Ratio de la marge brute sur vente	_____	_____	_____	_____	_____	_____
20. Nombre de nouveaux produits	_____	_____	_____	_____	_____	_____
21. Taux d'introduction de nouveaux produits	_____	_____	_____	_____	_____	_____
22. Nombre de lignes de produits	_____	_____	_____	_____	_____	_____
23. Nombre de produits retirés du marché	_____	_____	_____	_____	_____	_____
24. Taux de retrait de produits du marché	_____	_____	_____	_____	_____	_____
25. Niveau d'inventaires exprimés en unités	_____	_____	_____	_____	_____	_____
a) matières premières	_____	_____	_____	_____	_____	_____
b) produits semi-finis	_____	_____	_____	_____	_____	_____
c) produits finis	_____	_____	_____	_____	_____	_____
26. Ratio de rotation des inventaires	_____	_____	_____	_____	_____	_____
27. Niveau des inventaires exprimés en dollars	_____	_____	_____	_____	_____	_____
a) matières premières	_____	_____	_____	_____	_____	_____
b) produits semi-finis	_____	_____	_____	_____	_____	_____
c) produits finis	_____	_____	_____	_____	_____	_____
28. Nombre d'heures machine ou d'heures usine utilisées	_____	_____	_____	_____	_____	_____
29. Pourcentage d'utilisation de la capacité de production ou des ressources	_____	_____	_____	_____	_____	_____
30. Nombre et durée des temps morts de production	_____	_____	_____	_____	_____	_____
31. Nombre de nouveaux employés	_____	_____	_____	_____	_____	_____
32. Nombre d'heures de main-d'oeuvre	_____	_____	_____	_____	_____	_____
33. Nombre d'heures-homme par quarts de travail	_____	_____	_____	_____	_____	_____
34. Nombre d'accidents de travail	_____	_____	_____	_____	_____	_____
35. Taux d'incidence d'accidents de travail	_____	_____	_____	_____	_____	_____

	-----Question 1-----					-Question 2-		
	<u>Jamais</u>	INDICATEURS UTILISÉS					Lien avec	
		<u>Jour</u>	<u>Semaine</u>	<u>Mois</u>	<u>Trimestre</u>	<u>Année</u>	les résultats <u>financiers</u>	
36. Taux d'absentéisme (i.e. heures, employé ou %)	_____	_____	_____	_____	_____	_____	_____	
37. Nombre de griefs reçus	_____	_____	_____	_____	_____	_____	_____	
38. Nombre de griefs résolus	_____	_____	_____	_____	_____	_____	_____	
39. Nombre d'unités produites	_____	_____	_____	_____	_____	_____	_____	
40. Taux de rejet de produits (services) défectueux	_____	_____	_____	_____	_____	_____	_____	
41. Volume de matières premières rejetées	_____	_____	_____	_____	_____	_____	_____	
42. Volume de déchets produits	_____	_____	_____	_____	_____	_____	_____	
43. Niveau de consommation d'énergie: carburant, électricité, gaz naturel, etc.	_____	_____	_____	_____	_____	_____	_____	
44. Facteurs de rendement de la production ou des services:								
a) unités produites par qté de matières premières utilisées	_____	_____	_____	_____	_____	_____	_____	
b) unités produites par heure de main- d'oeuvre	_____	_____	_____	_____	_____	_____	_____	
c) unités produites par heure-machine	_____	_____	_____	_____	_____	_____	_____	
d) unités produites par superficie utilisée	_____	_____	_____	_____	_____	_____	_____	
45. Total des coûts par département	_____	_____	_____	_____	_____	_____	_____	
46. Coût unitaire des produits (services) fabriqués (rendus)	_____	_____	_____	_____	_____	_____	_____	
47. Coût unitaire des produits défectueux	_____	_____	_____	_____	_____	_____	_____	
48. Analyse d'écarts (budget vs réel) exprimée en dollars	_____	_____	_____	_____	_____	_____	_____	
49. Analyse d'écarts du coût du matériel acheté	_____	_____	_____	_____	_____	_____	_____	
50. Réduction du coût dû à l'amélioration de la qualité des produits ou services	_____	_____	_____	_____	_____	_____	_____	
51. Total des dépenses	_____	_____	_____	_____	_____	_____	_____	
52. Coût des produits (services) vendus (rendus)	_____	_____	_____	_____	_____	_____	_____	
53. Bénéfice avant impôts	_____	_____	_____	_____	_____	_____	_____	
54. Bénéfice net	_____	_____	_____	_____	_____	_____	_____	
55. Ratio du fonds de roulement	_____	_____	_____	_____	_____	_____	_____	
56. Ratio de liquidité	_____	_____	_____	_____	_____	_____	_____	
57. Taux d'intérêt sur emprunts	_____	_____	_____	_____	_____	_____	_____	
58. Taux d'intérêt sur placements	_____	_____	_____	_____	_____	_____	_____	
59. Bénéfice net par action	_____	_____	_____	_____	_____	_____	_____	
60. Valeur marchande des actions	_____	_____	_____	_____	_____	_____	_____	
61. Ratio cours/bénéfice	_____	_____	_____	_____	_____	_____	_____	
62. Rendement sur les ventes	_____	_____	_____	_____	_____	_____	_____	

3- En vous référant aux indicateurs que vous utilisez aux pages 3 à 6, incluant ceux que vous avez ajoutés à la liste, pourriez-vous indiquer pour chaque fréquence d'utilisation, i.e. jour, semaine, mois, trimestre et année s'il y a lieu, le **numéro** correspondant aux **5 plus importants** indicateurs que vous utilisez. Inscrivez le **numéro des indicateurs** dans l'espace fourni ci-dessous.

	<u>Jour</u>	<u>Semaine</u>	<u>Mois</u>	<u>Trimestre</u>	<u>Année</u>
1. Le plus important indicateur	_____	_____	_____	_____	_____
2. Le deuxième plus important indicateur	_____	_____	_____	_____	_____
3. Le troisième plus important indicateur	_____	_____	_____	_____	_____
4. Le quatrième plus important indicateur	_____	_____	_____	_____	_____
5. Le cinquième plus important indicateur	_____	_____	_____	_____	_____

4- Caractéristiques du système de rémunération

L'objectif poursuivi dans cette section vise à déterminer les caractéristiques du système de rémunération utilisé pour évaluer et rémunérer votre performance. Indiquez la mesure dans laquelle chacun des énoncés suivants décrit le système de rémunération visant à déterminer votre rémunération.

	En total		En total					
	Désaccord		Accord					
1- L'évaluation de ma performance déterminée par mon supérieur immédiat repose sur des critères préétablis consistant en:								
a) des indicateurs non financiers de performance (i.e. nombre de produits fabriqués, nombre d'heures travaillées, nombre de produits rejetés, etc.).....	1	2	3	4	5	6	7	
b) des indicateurs financiers de performance (i.e., respect de mon budget financier, ratios financiers, coût unitaire, etc.)	1	2	3	4	5	6	7	
2. Ma rémunération dépend de mes résultats obtenus établis en fonction de mesures objectives de ma performance.....	1	2	3	4	5	6	7	
3. Ma rémunération est fonction de l'atteinte des objectifs financiers de mon unité.....	1	2	3	4	5	6	7	
4. Ma rémunération dépend principalement de la perception qu'a mon supérieur de la qualité de mon travail et de mon interaction avec les autres membres de l'organisation.....	1	2	3	4	5	6	7	
5. J'ai accès périodiquement aux registres contenant les résultats de ma performance.....	1	2	3	4	5	6	7	
6. Je conserve personnellement des registres concernant ma performance.....	1	2	3	4	5	6	7	

7. En vous référant à la liste d'indicateurs décrits aux pages 3 à 6 ainsi qu'à tout autre indicateur ajouté à cette liste en page 6, identifiez les **5 plus importants indicateurs** que vous estimez être à la base de l'évaluation de votre performance et que votre supérieur utilise pour établir votre rémunération. Dans le cas où les mesures de performance utilisées pour établir votre rendement **ne figurent pas sur cette liste**, indiquez la description de la mesure utilisée dans l'espace prévu ci-dessous.

Les mesures ou indicateurs les plus importants de ma performance sont:

	Indiquez le numéro de l'indicateur
1. La plus importante mesure	_____
2. La deuxième plus importante mesure	_____
3. La troisième plus importante mesure	_____
4. La quatrième plus importante mesure	_____
5. La cinquième plus importante mesure	_____

5- Caractéristiques de la stratégie de votre organisation

L'objectif poursuivi dans cette section est de déterminer la nature de la stratégie qu'emploie votre organisation, c'est-à-dire, une combinaison de comportements ou actions que votre organisation utilise au cours de ses échanges avec les agents économiques de son industrie ou de ses secteurs d'activités. En vous référant aux deux descriptions de stratégie ci-dessous, indiquez laquelle de ces descriptions correspond le mieux actuellement à votre organisation. (Veuillez considérer votre usine, division ou organisation comme un tout et prenez note qu'aucune de ces stratégies n'est foncièrement bonne ou mauvaise.)

"La **Compagnie A** maintient un créneau de marché sûr en offrant un groupe de produits/services relativement stables. Généralement, la Compagnie A ne se situe pas à la fine pointe du développement en terme de nouveaux produits/services ou de développement de marchés à l'intérieur de son secteur d'activités. La Compagnie A a tendance à ignorer les changements qui n'ont aucun impact direct sur son secteur d'activités actuel et concentre son attention sur la façon de faire le mieux possible son travail à l'intérieur de son champ d'activités".

"La **Compagnie B** effectue de fréquents changements à l'intérieur de son groupe de produits/services. De façon continue, la Compagnie B agit à titre de pionnier et d'innovateur dans de nouveaux secteurs de marchés, en dépit du fait que certains de ses efforts de développement ne soient pas tous de francs succès. La Compagnie B répond très rapidement à l'émergence de nouveaux besoins du marché ou d'opportunités d'affaires".

1. Indiquez laquelle de ces deux descriptions cadre le mieux avec la stratégie qu'emploie votre organisation.

Mon organisation est mieux décrite par: **Compagnie A** **ou** **Compagnie B**

6- Nature de l'environnement de votre organisation

La nature des relations d'affaires que votre entreprise entretient avec ses partenaires extérieurs tels que fournisseurs, clients, institutions financières, gouvernements et syndicats, peut prendre une importance particulière pour votre organisation. De façon plus précise, je voudrais connaître votre perception concernant le caractère prévisible de certaines caractéristiques ou comportements de l'environnement externe de votre organisation (1= extrêmement prévisible et 7= extrêmement imprévisible ou n/a = ne s'applique pas). Selon vous, comment percevez-vous votre capacité de prévoir les conditions entourant l'environnement externe de votre organisation?

		<u>Prévisible</u> <u>Imprévisible</u>							
1. Fournisseurs de matières premières (services), de composantes et sous-traitants:									
a.	leurs changements dans les prix sont.....	n/a	1	2	3	4	5	6	7
b.	leurs changements dans le niveau de la qualité sont..	n/a	1	2	3	4	5	6	7
c.	leurs changements dans le design de leurs produits sont.....	n/a	1	2	3	4	5	6	7
d.	l'introduction de nouvelles matières premières ou composantes est.....	n/a	1	2	3	4	5	6	7
2. Comportement des compétiteurs:									
a.	leurs changements dans les prix sont.....	n/a	1	2	3	4	5	6	7
b.	leurs changements dans le niveau de la qualité sont..	n/a	1	2	3	4	5	6	7
c.	leurs changements dans le design de leurs produits sont.....	n/a	1	2	3	4	5	6	7
d.	l'introduction de nouveaux produits est.....	n/a	1	2	3	4	5	6	7
3. Consommateurs:									
a.	leur demande pour les produits existants est.....	n/a	1	2	3	4	5	6	7
b.	leur demande pour de nouveaux produits est.....	n/a	1	2	3	4	5	6	7
4. Marchés financiers:									
a. les changements dans les taux d'intérêts:									
	1. sur la dette à court terme sont.....	n/a	1	2	3	4	5	6	7
	2. sur la dette à long terme sont.....	n/a	1	2	3	4	5	6	7
b. les changements dans les instruments financiers disponibles:									
	1. pour la dette à court terme sont.....	n/a	1	2	3	4	5	6	7
	2. pour la dette à long terme sont.....	n/a	1	2	3	4	5	6	7
c. les changements dans la disponibilité de crédit:									
	1. pour de la dette à court terme sont.....	n/a	1	2	3	4	5	6	7
	2. pour de la dette à long terme sont.....	n/a	1	2	3	4	5	6	7

		<u>Prévisible</u> <u>Imprévisible</u>							
5. Réglementations gouvernementales:									
a.	les changements dans les lois ou politiques touchant les prix sont.....	n/a	1	2	3	4	5	6	7
b.	les changements dans les lois ou la réglementation concernant la normalisation ou la qualité des produits sont.....	n/a	1	2	3	4	5	6	7
c.	les changements dans les lois et politiques concernant les pratiques financières sont.....	n/a	1	2	3	4	5	6	7
d.	les changements dans les normes ou la législation du travail sont.....	n/a	1	2	3	4	5	6	7
e.	les changements dans les lois ou la réglementation concernant la commercialisation et la distribution de vos produits/services sont.....	n/a	1	2	3	4	5	6	7
f.	les changements dans les pratiques ou normes comptables sont.....	n/a	1	2	3	4	5	6	7
6. Actions des mouvements syndicaux:									
a.	les changements dans les salaires, heures et conditions de travail sont.....	n/a	1	2	3	4	5	6	7
b.	les changements dans la sécurité d'emploi que confère le mouvement syndical sont.....	n/a	1	2	3	4	5	6	7
c.	les changements dans les procédures de griefs sont....	n/a	1	2	3	4	5	6	7

7- Informations personnelles

L'objectif poursuivi dans cette section vise à obtenir certaines informations personnelles concernant votre formation académique, types et années d'expérience accumulées au sein de votre organisation ainsi que dans les autres organisations où vous avez travaillé auparavant.

1- Pourriez-vous indiquer par un 'X' la nature de votre formation académique et inscrivez le numéro de la discipline étudiée dans la colonne correspondante telle que décrite ci-dessous.

Diplôme	Diplôme obtenu	Discipline
1. Études secondaires.....	_____	n/a
2. Études collégiales.....	_____	_____
3. Certificat d'études universitaires.....	_____	_____
4. Baccalauréat.....	_____	_____
5. Maîtrise.....	_____	_____
6. Doctorat.....	_____	_____

Discipline(s):

1. Comptabilité/finance
2. Marketing
3. Administration/management/ressources humaines
4. Économie
5. Ingénierie (sciences appliquées)
6. Sciences pures
7. Sciences de la santé
8. Sciences sociales (ex.: psychologie, philosophie, langues, droit, géographie, etc.)
9. Autres (spécifiez..)
 - a) _____
 - b) _____
 - c) _____
 - d) _____

Si vous n'avez pas obtenu plus d'un diplôme d'une même catégorie, par exemple, 2 baccalauréats, passez à la question 4 à la page suivante.

2- Si vous avez obtenu plus d'un diplôme d'une même catégorie, par exemple, 2 baccalauréats, pourriez-vous indiquer dans l'espace prévu ci-dessous la nature du diplôme et le **numéro des disciplines** correspondantes.

Nature du diplôme	Discipline
a) _____	_____
b) _____	_____
c) _____	_____
d) _____	_____

Si vous ne poursuivez pas d'études actuellement ou n'avez pas interrompu vos études avant l'obtention d'un diplôme, passez à la question 4 à la page suivante.

3. Si vous poursuivez actuellement des études ou avez dû interrompre vos études avant l'obtention d'un diplôme, indiquez dans l'espace prévu ci-dessous le nature du diplôme que vous allez obtenir ou auriez obtenu, le numéro de la discipline ainsi que le nombre d'années d'études à temps plein complétées.

Nature du diplôme	Discipline	Nombre d'années complétées
a) _____	_____	_____
b) _____	_____	_____
c) _____	_____	_____
d) _____	_____	_____

4. Pourriez-vous indiquer le nombre d'années et la nature de votre expérience au sein de:

- 1) votre département actuel dans lequel vous occupez une fonction
- 2) d'autres départements précédents dans lesquels vous avez occupé une fonction au sein de votre organisation
- 3) départements divers au sein d'autres organisations pour lesquelles vous avez occupé des fonctions

	1) Département <u>Actuel</u> Nombre d'années d'expérience dans cette fonction au sein de votre <u>organisation</u>	2) Département(s) <u>Précédent(s)</u> Nombre d'années d'expérience dans cette(ces) fonction(s) au sein de votre <u>organisation</u>	3) Département(s) <u>Précédent(s)</u> Nombre d'années d'expérience dans cette(ces) fonction(s) au sein d'autres <u>organisations</u>
1. Comptabilité.....	_____	_____	_____
2. Finance et trésorerie.....	_____	_____	_____
3. Systèmes d'information.....	_____	_____	_____
4. Marketing.....	_____	_____	_____
5. Ressources humaines.....	_____	_____	_____
6. Service du contentieux.....	_____	_____	_____
7. Production et opérations.....	_____	_____	_____
8. Recherche et développement.....	_____	_____	_____
9. Autres Spécifiez: _____	_____	_____	_____

5. Titre de la fonction que vous occupez actuellement: _____

6. Affiliation(s) ou titre(s) professionnel(s) que vous détenez:

Spécifiez: a) _____
b) _____
c) _____
d) _____
e) _____

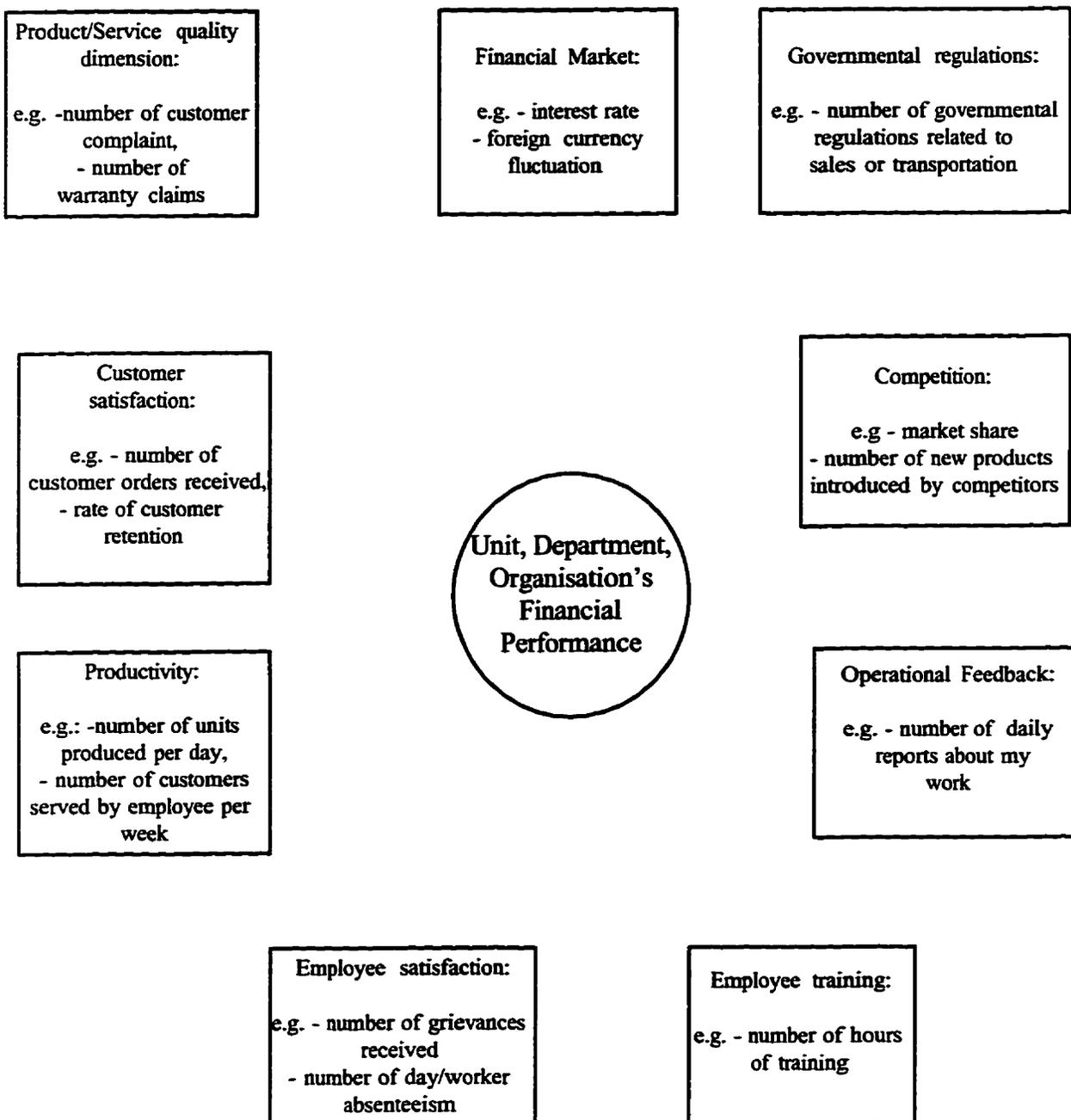
7. Votre âge: _____ 20 - 29
 _____ 30 - 39
 _____ 40 - 49
 _____ 50 - 59
 _____ 60 - +

Sincères remerciements pour votre participation à cette étude.

APPENDIX B
MANAGER'S FUNCTIONAL MENTAL MODEL

MENTAL MODEL:

1. I am interested in the nature of the relationships you perceive among the concepts described below and the financial performance of your unit, department or organisation. Please, draw lines and indicate the direction of the causal relationships with an arrow between any concepts you think are related to each other as well as those that have any impact on financial performance. Identify only the relationships you perceive between the different concepts. There is no right or wrong number of relationships.
2. After identifying the relationships you perceive between these concepts, please rank the five most important relationships that you think are critical to assure the achievement of your unit, department or organisation's financial performance. Please, indicate the rank on the line you have previously drawn.

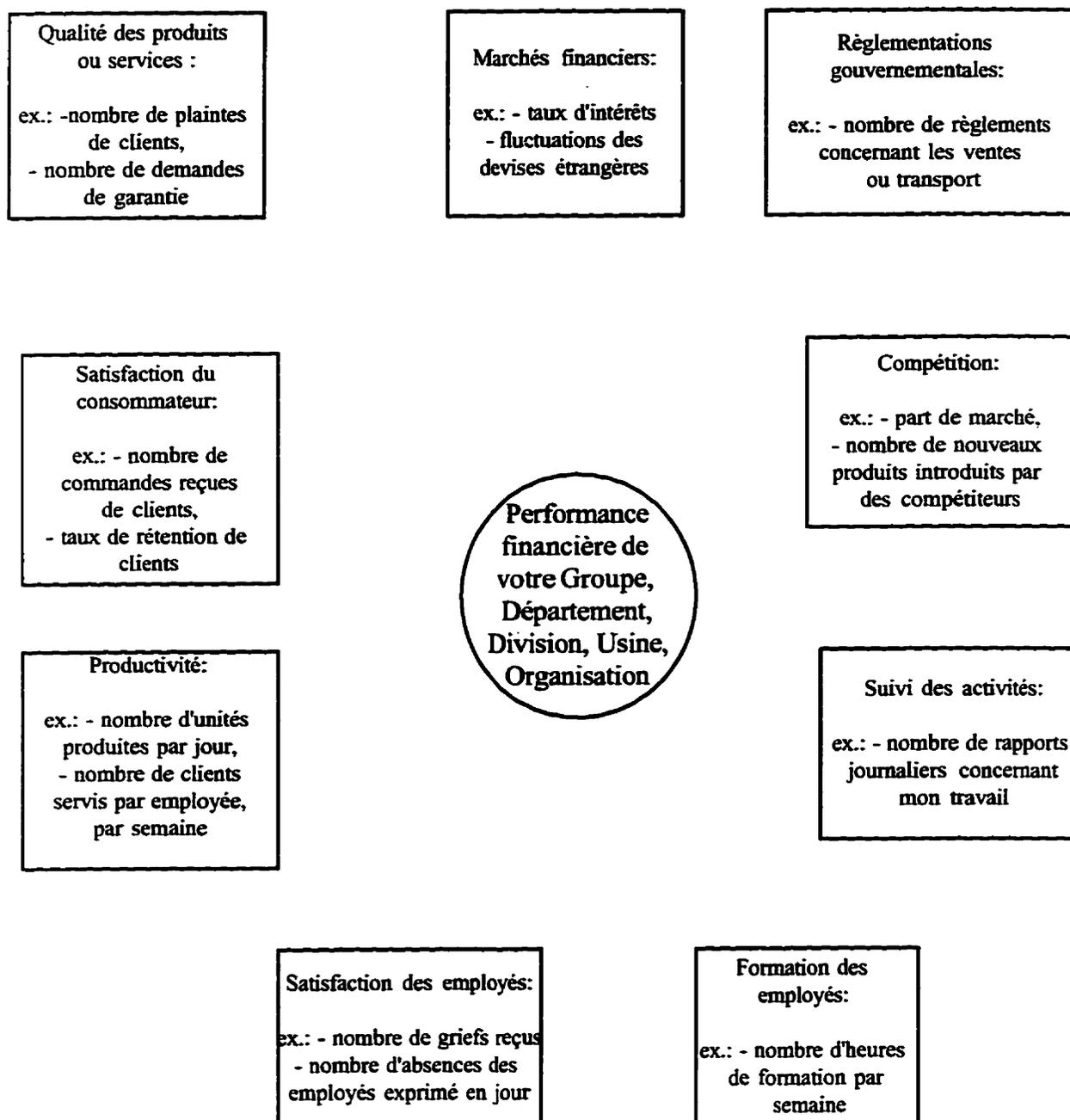


MANAGER'S FUNCTIONAL MENTAL MODEL
(FRENCH VERSION)

MODELE MENTAL:

1. Je m'intéresse à la nature des relations que vous percevez entre différents concepts décrits ci-dessous tels que productivité, satisfaction du consommateur et la performance financière de votre groupe de travail, département, division, usine ou organisation. Pourriez-vous indiquer les relations de cause à effet que vous percevez entre ces différents concepts de même qu'avec la performance financière de votre organisation en traçant une ligne entre les concepts en ayant soin d'identifier la direction de la cause à effet au moyen d'une flèche. N'identifiez uniquement que les relations entre les concepts que vous percevez. Il n'y a pas de bonnes ou de mauvaises réponses.

2. Après avoir indiqué les relations que vous percevez, pourriez-vous identifier les cinq plus importantes relations que vous percevez en attribuant "1" à la plus importante et "5" à la cinquième plus importante relation de cause à effet que vous considérez comme critique pour l'atteinte des objectifs financiers de votre équipe, département, division, usine ou organisation. Indiquez le niveau d'importance des cinq plus importantes relations sur la ligne correspondante reliant les concepts concernés que vous aurez tracée.



APPENDIX C
FIELD INTERVIEW GUIDE

FIELD INTERVIEW GUIDE

1.1 INTRODUCTION

This field-survey study investigates the determinants of the mix of quantitative financial and quantitative non-financial information managers use in organisations. This research will lead to the development of a theoretical model that will explain managers' mix of quantitative information. The general purpose of this study is to provide "small scale tests" supporting the development of a theory of the determinants of the mix of quantitative information managers use. The field study approach also allows for conducting the field work according to a pre-established research or inquiry plan with certain flexibility such that it leaves room for the identification of important omitted factors that could potentially influence the mix of quantitative information managers use. This interview plan has no other purpose than to provide a series of possible questions that can be asked to managers. The interview process remains very flexible in the sense that other relevant questions can be used to deepen managers' answers or to target other interesting and relevant issues managers may raise during the interview.

Section I includes the objective instruments, i.e. financial and non-financial ratios, required to classify the firm's strategy. It also includes a series of general inquiries about the manager's use of information systems in the organisation and other information required to grasp the nature of the organisational environment within which the manager works.

Section II contains the validation of some of the information obtained through the questionnaire described in Appendix A. It also includes specific inquiries about examples

of typical decisions each strategic, tactical, and operational manager makes in the production-operations, human resources, and marketing-sales functions. In addition, Section II provides the questions used to assess the manager's perceptions about the causal relationships among the measures he uses for monitoring and decision-making purposes.

SECTION I: GENERAL INFORMATION

The purpose of these inquiries is to identify the information system context within which strategic, tactical, and operational managers monitor the organisation's process and make decisions based on the mix of quantitative information they use. This field work also investigates the manager's perceptions and some of his motives for using quantitative financial and quantitative non-financial information in his mix of information.

Section I includes the information required to corroborate the manager's classification of the firm's strategy based on financial and non-financial ratios. It also provides a guideline for the information gathering during the site visit eliciting characteristics of the organisation such as its main lines of products/services, facilities, main processes. Moreover, this section includes the selection procedures of the strategic, tactical, and operational managers participated in this study. Those managers will be asked to identify the sources of formal and ad hoc information, i.e. computerised and manual information systems, they use for monitoring and decision-making purposes.

1.1 Identifying the organisation's strategy

The organisation's strategy may influence the mix of quantitative information managers use. The use of financial and non-financial ratios provides objective criteria to classify the firm's strategy based on the information obtained from the organisation's accounting department. These ratios are compared with the managers' perception along with the researcher's classification of the organisation's strategy. In situations where a conflicting categorisation of the organisation's strategy using ratios and managers' and

researcher's perceptions occurs, the objective indicators are used to identify the firm's strategy.

1- Obtain from the accounting department the following statistics:

- a. Number of employees based on the yearly average: _____
- b. Total number of current product lines: _____
- c. Total number of new products introduced in the past three years: _____

(In thousand of dollars)

Based on last year's financial results of your organisation:

- d. Total sales: _____
- e. Total marketing expenditures
(i.e. direct promotion, advertising, and personal selling expenses): _____
- f. Total research and development expenditures: _____
- j. Total fixed assets: _____
- h. Total assets: _____

1.2 Site Visit

Completed at the beginning of the field-work, a site visit provides opportunities to gather information on 1) what are the firm's main production processes, 2) the type of technology used, 3) the nature of the production setting, 4) the types of products/services produced or delivered, 5) the types of information posted in the work area or discussed by employees and managers that may help identify the types of information they consider

important, etc. The current organisational flow-chart will be obtained or developed to identify the responsibility of the managers involved in the study. The site visit information is also helpful to guide the interview and to cross-validate information gathered through the interviews and questionnaires.

1. During the site visit, identify the:

- a. types of manufacturing technology the organisation uses
- b. types of products/services produced or delivered
- c. main production processes
- d. plant lay-out
- e. types of equipment/systems that provide production information
- f. types of information posted in the work area

1.3 Screening procedures

The managers involved in this study are chosen based on the hierarchical position they occupy as a proxy for the type of decisions they make in the organisation. Three levels of management in each functional area, i.e. production-operation, marketing-sale, and human resources will be asked to participate in this study. The head of each functional area, a middle or plant or divisional manager, and a first level or factory-floor or operation manager will participate in the study. Consequently, each strategic, tactical, and operational manager from the production-operation, marketing-sales, and human resources functional will complete a questionnaire and participate in an interview that will take respectively 75 minutes and 30 to 75 minutes of their time. Each manager will receive the questionnaire along with verbal directions about how to complete it. A

structured interview including open-ended questions will be conducted with each of the managers after they have completed the questionnaire. This interview will take place at a convenient time for them thereby avoiding undue disruption of their normal operating activities.

1.4 Types of information systems used:

Each manager's information environment may vary across the organisation and may influence the type of information he uses. The type of information managers use is determined by the types of information systems, i.e. computerised or manual, they have access to or they have developed for their own purposes. Consequently, the nature of the information systems, i.e. formal (legitimised by the strategic management) or informal or ad hoc (illegitimised by the strategic management and kept by each manager) will be identified by each manager involved in this study. This information will help to clarify the association between the type and status i.e. formal or informal, of information systems that provide managers with information (e.g. quantitative financial or quantitative non-financial) they use for monitoring and decision-making purposes. For these reasons, each strategic, tactical, and operational manager from each functional area involved in this study will be asked the following questions:

1. How many employees do you supervise?

- directly:
- indirectly:

2. Could you identify the types of information systems from which you usually obtain the quantitative information you use, F: formal, IN: informal information systems?

a. Financial information

1- financial budgeting system	F	IN
2- financial reporting system	F	IN
3- costing systems: traditional, ABC, etc.	F	IN
4- inventory systems	F	IN
5- other:		

b. Non-financial information

6- on-line production systems	F	IN
7- manual production systems	F	IN
8- JIT system	F	IN
9- computer-aided-manufacturing	F	IN
10- sales department systems: number of orders, complaints, etc.	F	IN
11- payroll systems: hours of absenteeism, hours worked, etc.	F	IN
12- other: any other information systems, such as employee information systems or executive information systems that record and report information systematically	F	IN

3. What are, if any, the other formal or informal information systems you use for monitoring and decision-making purposes?

Formal:

Informal:

4. What are the reasons for using (or not using) information systems other than those maintained by the accounting or computer service departments?

5. How do you perceive the formal information systems that are maintained in your organisation?

SECTION II: VALIDATION OF INFORMATION FROM THE QUESTIONNAIRE AND INQUIRY

The purpose of this section is to triangulate the information gathered through the questionnaire described in Appendix A. This section also investigates managers' perceptions and motives for the use of quantitative financial and quantitative non-financial information. To achieve these objectives, various questions related to the variables captured by the questionnaire are asked to the managers involved in this study.

This section also includes the questions used to assess the manager's perception of causal relationships that can exist between quantitative financial and quantitative non-financial information. The validation questions and those used to assess the manager's perceptions are as follows:

2.1 Perceived environmental uncertainty:

1. How would you describe the environment in which your organisation is operating in terms of:
 - a. its perceived level of competition?
 - stable/ unstable
 - heterogeneous/ homogenous
 - b. the difficulty to predict changes in your organisation's external environment?
 - changes in customer tastes
 - changes in government regulations
 - changes in labour unions contracts

2.2 Task-technology:

1. How would you describe your job in terms of:
 - a. its number of written procedures that tell you how to deal with specific problems?
 - procedures do exist
 - procedures do not exist
 - b. its level of routinisation?
 - routine or nonroutine

2.3 Types of Decisions:

1. Could you describe to me an example of a decision you make on a daily, weekly, monthly, quarterly, yearly basis that is representative of your functional position?
 - a) daily:
 - b) weekly:
 - c) monthly:
 - d) quarterly:
 - e) yearly:

2.4 Reward systems:

1. How is your compensation related to how well you did on specific quantitative performance measures?
 - a. directly related to my level of performance
 - b. not at all related to my level of performance
 - c. other:
2. Which type of information does your supervisor use to assess your performance?
 - a. financial:
 - b. non-financial:
 - c. other:
3. Do you perceive that these measures accurately reflect your level of performance?
 - a. financial: reflect it fairly or not at all
 - b. non-financial: reflect it fairly or not at all

2.5 The perceived causal relationships among measures

1. On which types of measures do you mainly rely to monitor the achievement of your organisation's (division, department, or unit) objectives?
 - a. mainly financial
 - b. mainly non-financial
 - c. other:

2. Why do you rely on these (financial or non-financial) measures to monitor the achievement of your organisation's (department's or unit's) objectives?

3. What are the main factors or reasons that influence your use of more quantitative financial (non-financial) information than non-financial (financial) information?
 - a. your education
 - b. your experience in other organisations
 - c. your experience in prior positions occupied in your organisation
 - d. your experience in your current position
 - e. your supervisor asks you to use such information
 - f. your perception that non-financial (financial) measures drive your performance
 - g. you are specifically evaluated on such measures
 - h. your perception of having better control over the information itself:
 - you know how the information is gathered
 - you know the criteria upon which each measure is based on
 - you know that the measures cannot be manipulated by others
 - you are the only one to use such measures and their use gives you more information, or more influence than others
 - i. the information is available on a daily, weekly, monthly, quarterly, and yearly basis

4. Could give me an example of an important performance indicator that you use on a daily, weekly, monthly, quarterly, and yearly basis and explain why you are using it?

- daily:
 - why:
- weekly:
 - why:
- monthly:
 - why:
- quarterly:
 - why:
- yearly:
 - why:

5. If you were given the opportunity to make changes in the information systems you use:

a. which type of information would you ask for and why?

	reasons
- nothing:	
- financial:	
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
- non-financial:	
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
- other:	
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____

2.6 Managers' functional mental model

The instrument described in Appendix B serves to capture the manager's functional mental model. Verbal instructions are given to the manager before he completes the instrument in Appendix B. Along with this instrument, the responses to the questionnaire related to the manager's education, past and current experience are validated during the conversation with each manager.

FIELD INTERVIEW GUIDE
(FRENCH VERSION)

PROCÉDURES D'ENTREVUES

Ce guide d'entrevues consiste en une série de questions qui s'adressent aux gestionnaires sélectionnés au sein des entreprises participant à cette recherche. Les gestionnaires inclus dans cette recherche sont un gestionnaire de niveau stratégique, tactique et opérationnel provenant des secteurs de la production-operations, marketing-ventes et ressources humaines, représentant un total possible de neuf gestionnaires par organisation.

Au cours de cette entrevue, chaque gestionnaire aura à répondre à des questions spécifiques servant à la validation de l'information recueillie au moyen du questionnaire et à l'obtention de nouvelles informations. Les mêmes questions seront utilisées pour tous les gestionnaires de même niveaux décisionnels soit stratégique, tactique et opérationnel dans les organisations prenant part à cette recherche. D'autres questions pourront être utilisées pour approfondir certaines réponses des gestionnaires. Les questions suivantes constituent uniquement un guide visant à uniformiser le processus d'entrevues. Les questions pouvant être utilisées durant l'entrevue sont les suivantes:

PARTIE I: INFORMATIONS GÉNÉRALES

1.1 Identification de la stratégie organisationnelle

Les informations suivantes permettent de classifier votre organisation en se basant sur sa taille, l'intensité de développement de ses produits et de ses ventes et ce au moyen d'information financière et non financière.

1- Obtenir les informations suivantes auprès du département finance:

- a. Nombre d'employés selon une moyenne annuelle: _____
- b. Nombre de lignes de produits existantes: _____
- c. Nombre de nouveaux produits introduits au cours des trois dernières années: _____

(En milliers de dollars)

Selon les chiffres du dernier exercice financier de votre organisation:

- d. Total des ventes: _____
- e. Total des dépenses de marketing:
(i.e. promotion, publicité et coût de la force de ventes) _____
- f. Total des frais de recherche et développement: _____
- g. Total des immobilisations: _____
- h. Total des actifs: _____

1.2 Visite de l'organisation

Au cours de la visite de l'entreprise, recueillir les informations suivantes:

- a) Caractéristiques de la technologie de production utilisée
- b) Nature des produits/services
- c) Principaux procédés de production utilisés
- d) Plan des installations de production
- e) Caractéristiques des équipements ou systèmes produisant de l'information
- f) Nature de l'information affichée dans les lieux de travail

1.3 Sélection des managers (voir version anglaise)

1.4 Types de systèmes d'information utilisés:

1. Combien d'employés supervisez-vous?

- directement:
- indirectement:

2. Pourriez-vous identifier le type de systèmes d'information desquels vous tirez l'information quantitative que vous utilisez, F: formel, IN: informel

a) Informations financières:

- | | | |
|---|---|----|
| 1- budgets financiers | F | IN |
| 2- système comptable produisant les états financiers | F | IN |
| 3- système comptables servant à déterminer le prix coûtant unitaire | F | IN |
| a) système traditionnel de détermination du coût unitaire | F | IN |
| b) système de comptabilité par activités | F | IN |
| 4- systèmes d'inventaires | F | IN |
| 5- autres: | | |

b) Informations non financières:

6- systèmes d'information reliés on-line aux systèmes contrôlant la production:	F	IN
7- systèmes d'information manuels produisant des informations de production	F	IN
8- systèmes d'inventaires juste à temps (JIT)	F	IN
9- systèmes d'information de support à la production	F	IN
10- systèmes d'information du département des ventes: nombre de commandes, nombres de plaintes reçues, etc.	F	IN
11- systèmes de paye: nombre d'heures d'absentéisme, nombre d'heures travaillées	F	IN
12- autres: systèmes d'information sur mesure pour les gestionnaires qui puisent dans les bases de données les informations requises pour produire des rapports d'exception	F	IN

c) Quels sont les autres systèmes d'information formels et informels que vous utilisez pour fins de gestion ou de prise de décisions?

Formels:

Informels:

d) Pour quelles raisons utilisez-vous d'autres (ou pas d'autres) systèmes d'information que ceux supportés par le département informatique ou de la comptabilité (i.e., informels)?

e) Quelle est votre perception des systèmes d'information formels, i.e. ceux qui sont privilégiés par la direction de votre organisation?

PARTIE II: VALIDATION DE L'INFORMATION OBTENUE AU MOYEN DE QUESTIONNAIRE ET COLLECTE D'AUTRES INFORMATIONS

2.1 Nature de l'environnement de votre organisation

1. Comment décririez-vous l'environnement externe dans lequel se trouve votre organisation en terme de:

a) son niveau de compétition?

- stable/instable
- hétérogène/homogène

b) niveau de difficultés à prédire les changements prenant place dans l'environnement externe de votre organisation?

- changements dans le goût des consommateurs
- changements dans les réglementations gouvernementales
- changements dans les conventions collectives de travail

2.2 Caractéristiques de votre travail ou fonction

1. Comment décrieriez-vous votre travail ou fonction en terme de:

a) son niveau de procédures écrites auxquelles vous avez accès et qui vous informent sur la manière de résoudre certains problèmes spécifiques?

- des procédures existent-elles? OUI ou NON

b) son niveau de routine?

- travail routinier ou non routinier

2.3 Caractéristiques des décisions

1. Pourriez-vous décrire un exemple typique de décisions que vous avez à prendre de façon journalière, hebdomadaire, mensuelle, trimestrielle et annuelle:

- journalière:
- hebdomadaire:
- mensuelle:
- trimestrielle:
- annuelle:

2.4 Caractéristiques des systèmes de rémunération

1. Comment qualifieriez-vous la relation, si relation il y a, entre votre rémunération et votre niveau de performance établie à partir de mesures quantitatives spécifiques:

- a) ma rémunération est directement reliée à mon niveau de performance
- b) ma rémunération n'est en aucun cas reliée à mon niveau de performance
- c) autre:

2. Quel(s) type(s) d'informations votre superviseur utilise-t-il pour établir votre performance?

Spécifiez la mesure

- a) financière:
- b) non financière:
- c) autre:

3. Considérez-vous que ces mesures reflètent correctement votre niveau réel de performance?

- | | | |
|--------------------------------|-----|-----|
| a) les mesures financières: | OUI | NON |
| b) les mesures non financières | OUI | NON |

2.5 Perceptions de la relation de cause à effet entre les mesures financières et non financières

1. Quel(s) type(s) de mesures utilisez-vous pour contrôler l'atteinte des objectifs de votre groupe de travail, département, usine, division ou organisation?

- a) principalement de l'information quantitative financière
- b) principalement de l'information quantitative non financière
- c) autres

2. Pourquoi utilisez-vous ce genre d'informations (financières ou non financières) pour contrôler l'atteinte des objectifs de votre organisation?

3. Quels sont les principaux facteurs ou raisons motivant l'utilisation de plus d'informations quantitatives financières (non financières) que d'informations quantitatives non financières (financières)?
- a) votre formation académique
 - b) votre expérience à l'intérieur d'autres organisations
 - c) votre expérience dans diverse fonctions que vous avez occupées au sein de votre organisation
 - d) votre expérience dans votre fonction actuelle
 - e) votre superviseur vous demande d'utiliser ce type d'information
 - f) votre perception que les mesures non financières 'drive' ou déterminent votre performance
 - g) votre rémunération dépend principalement de vos résultats sur ces mesures
 - h) votre perception d'avoir un meilleur contrôle sur cette information:
 - vous connaissez comment les données sont recueillies pour obtenir ces mesures
 - vous connaissez la méthode de calcul inhérente à chacune des mesures que vous utilisez
 - vous savez que ces mesures ne peuvent pas être manipulées ou faussées par d'autres
 - vous êtes la seule personne à utiliser ces mesures et elles vous donnent plus d'information sur les opérations ou plus d'influence dans l'organisation que d'autres mesures
 - i) l'information est disponible de façon journalière et ce lorsque vous en avez besoin
4. Pourriez-vous me citer un exemple d'une importante mesure de performance que vous utilisez de façon journalière, hebdomadaire, mensuelle, trimestrielle et annuelle, et m'en expliquez la raison de son utilisation?
- journalière:
 - raison:
 - hebdomadaire:
 - raison:
 - mensuelle:
 - raison:
 - trimestrielle:
 - raison:
 - annuelle:
 - raison:

5. Si vous aviez l'opportunité de faire des changements aux systèmes d'informations que vous utilisez:

a) quel type d'information voudriez-vous obtenir et pour quelle(s) raison(s)?

raisons

- aucune

- financières:

a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____

- non financières:

a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____

- autres:

a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____

2.6 Modèle mental des gestionnaires

1. Faire compléter l'annexe B

2. Vérifier les informations personnelles recueillies dans le questionnaire.

REFERENCES

- Abernethy, Margaret A. and Lillis, Anne M., 1995, "The Impact of Manufacturing Flexibility on Management Control Systems Design", Accounting, Organisations and Society, Vol. 20., No. 4, 241-258.
- American Accounting Association, 1975, "Report of the Committee on Non-Financial Measures of Effectiveness", American Accounting Association, Sarasota, Florida.
- Anthony, Robert N., 1965, Planning and Control Systems: A Framework for Analysis, Boston, MA: Harvard College.
- Anthony, Robert N., Dearden, John, and Govindarajan, Vijay, 1992, Management Control Systems, Boston, MA: Richard D. Irwin, Inc.
- Armitage, Howard M. and Atkinson, Anthony A., 1990, The Choice of Productivity Measures in Organisations: A Field Study of Practice in Seven Canadian Firms, A Research Monograph Prepared for The Research Studies Committees, The Society of Management Accountants of Canada.
- Atkinson, Anthony A., 1990, "Book Reviews/Compte rendu de livres", Contemporary Accounting Research, Vol. 6, No. 2, 931-961.
- Atkinson, Anthony A, Banker, Rajiv D., Kaplan, Robert S., and Young, S. Mark, 1995, Management Accounting, Englewood Cliffs, N.J.: Prentice-Hall, Inc.
- Atkinson, Anthony A. and Waterhouse, John H., 1995, "Measuring Organisation Performance: A Framework for Analysis", Performance Indicator Systems Conference Proceedings, University of Waterloo, School of Accountancy, April 18, 1995.
- Atkinson, Anthony A. and Waterhouse, John H., 1996, "Strategic Performance Measurement: Scope and Implementation Issues", Unpublished working paper, University of Waterloo, Waterloo, Ontario, Canada.
- Atkinson, Anthony A. and Waterhouse, John H., and Wells, Robert B., 1996, "Strategic Performance Measurement: Theory and Practice", Unpublished working paper, University of Waterloo, Waterloo, Ontario, Canada.
- Baiman, Stanley, 1990, "Agency Research in Managerial Accounting: a Second Look", Accounting, Organisations and Society, Vol. 15, No. 4, 341-371.
- Baker, Georges P., Jensen, Michael C., and Murphy, Kevin J., 1988, "Compensation and Incentives: Practice vs. Theory", The Journal of Finance, Vol. 43, No. 3, 593-616.
- Barr, Pamela S., Stimpert J. L., and Huff, Anne S., 1992, "Cognitive Change, Strategic Action, and Organisational Renewal", Strategic Management Journal, Vol. 13, No. 1, 15-36.

- Birchard, B., 1994, "The Call for Full Disclosure", CFO: the Magazine for Senior Financial Executives, December, 30-42.
- Birnberg, Jacob G., Turopolec, Lawrence, and Young, S. Mark, 1983, "The Organisational Context of Accounting", Accounting, Organisations and Society, Vol. 8, No. 2, 111-129.
- Bonner, Sarah E., 1990, "Experience Effects in Auditing: The Role of Task-Specific Knowledge", The Accounting Review, Vol. 65, No. 1, 72-92.
- Bronwell, Peter and Merchant, Kenneth A., 1990, "The Budgetary and Performance Influences of Product Standardisation and Manufacturing Process Automation", Journal of Accounting Research, Vol. 28, No. 2, 388-397.
- Bruns, William J. and Waterhouse, John H., 1975, "Budgetary Control and Organisation Structure", Journal of Accounting Research, Vol. 13, No. 2, 177-203.
- Bruns, William J. Jr. and McKinnon, Sharon M., 1993, "Information and Managers: A Field Study", Journal of Management Accounting Research, Vol. 5, Fall, 84-123.
- Buchko, Aaron A., 1994, "Conceptualisation and Measurement of Environmental Uncertainty: An Assessment of the Miles and Snow Perceived Environmental Uncertainty Scale", Academy of Management Journal, Vol. 37, No. 2, 410-425.
- Burns, Tom and Stalker, George M., 1961, The Management of Innovation, London, England: Tavistock.
- Calori, Roland, Johnson, Gerry, and Sarnin, Philippe, 1994, "CEOs' Cognitive Maps and the Scope of the Organisation", Strategic Management Journal, Vol. 15, No. 6, 437-457.
- Campbell, Annhenrie, 1994, "Measuring Auditors' Reliance on Internal Auditors: A Test of Prior Scales and a New Proposal", Behavioral Research in Accounting, Vol. 6, 110-120.
- Cammann, Cortlandt, 1976, "Effects of the use of Control Systems", Accounting, Organisations and Society, Vol. 1, No. 4, 301-313.
- Chandler, Alfred D. JR., 1962, Strategy and Structure, Cambridge, MA: M.I.T. Press.
- Chenhall, Robert H. and Morris, Deigan, 1986, "The Impact of Structure, Environment, and Interdependence on the Perceived Usefulness of Management Accounting Systems", The Accounting Review, Vol. 61, No. 1, 16-35.
- Chewning, Eugene G. JR and Harrell, Adrian M., 1990, "The Effect of Information Load on Decision Makers' Cue Utilisation Levels and Decision Quality in a Financial Distress Decision Task", Accounting, Organisations and Society, Vol. 15, No. 6, 527-542.

- Clancy, Donald K. and Collins, Frank, 1979, "Informal Accounting Information Systems: Some Tentative Findings", Accounting, Organisations and Society, Vol. 4, No. 1, 21-30.
- Coates, Jeff, Davis, Ted, and Stacey, Ray, 1995, "Performance Measurement Systems, Incentive Reward Schemes and Short-termism in Multinational Companies: a Note", Management Accounting Research, Vol. 6, No. 2, 125-135.
- Cook, Thomas D. and Campbell, Donald T., 1979, Quasi-Experimentation: Design and Analysis Issues for Field Settings, Boston, MA: Houghton Mifflin Company.
- Cooper, Robin and Kaplan, Robert S., 1991, The Design of Cost Management Systems, Englewood Cliffs, N.J.: Prentice Hall.
- Crocker, Linda and Algina, James, 1986, Introduction to Classical & Modern Test Theory, Orlando, Fl.: Harcourt Brace Jovanovich College Publisher, Inc.
- Cunningham, Gary M., 1992, "Management Control and Accounting Systems under a Competitive Strategy", Accounting, Auditing and Accountability Journal, Vol. 5, No. 2, 85-102.
- Curtis, Carey C., 1994, "Non-financial Performance Measures in New Product Development", Journal of Cost Management, Vol. 8, No. 3, 18-26.
- Daft, Richard L. and Lengel, Robert H., 1986, "Organisational Information Requirements, Media Richness and Structural Design", Management Science, Vol. 32, No. 5, 554-571.
- Daft, Richard L., Sormunen, Juhani, and Parks, Don, 1988, "Chief Executive Scanning, Environmental Characteristics, and Company Performance: An Empirical Study", Strategic Management Journal, Vol. 9, No. 2, 123-139.
- Dawes, Robyn M., 1979, "The Robust Beauty of Improper Linear Models in Decision-Making", American Psychologist, Vol. 34, No. 7, 571-582.
- Day, David V. and Lord, Robert G., 1992, "Expertise and Problem Categorisation: The Role of Expert Processing in Organisational Sense-Making", Journal of Management Studies, Vol. 29, No. 1, 35-47.
- Dearborn, Dewitt C. and Simon, Herbert A., 1958, "Selective Perception: A Note on the Departmental Identifications of Executives", Sociometry, Vol. 21, 140-144.
- Dent, Jeremy F., 1990, "Strategy, Organisation and Control: Some Possibilities for Accounting Research", Accounting, Organisations and Society, Vol. 15, No. 2, 3-25.
- Duncan, Robert B., 1972, "Characteristics of Organisational Environments and Perceived Environmental Uncertainty", Administrative Science Quarterly, Vol. 17, No. 3, 313-327.

- Dvir, Dov, Segev, Eli, and Shenhar, Aaron, 1993, "Technology's Varying Impact on the Success of Strategic Business Units Within the Miles and Snow Typology", Strategic Management Journal, Vol. 14, No. 2, 155-161.
- Einhorn, Hillel J., 1974, "Expert Judgement: Some Necessary Conditions and an Example", Journal of Applied Psychology, Vol. 59, No. 5, 562-571.
- Fiol, C. Marlene and Huff, Anne Sigismund, 1992, "Maps for Managers: Where are We? Where Do We Go from Here?", Journal of Management Studies, Vol. 29, No. 3, 267-285.
- Fisher, Joseph and Govindarajan, Vijay, 1993, "Incentive Compensation Design, Strategic Business Unit Mission, and Competitive Strategy", Journal of Management Accounting Research, Vol. 5, Fall, 129-144.
- Fisher, Joseph, 1992, "Use of Non-financial Performance Measures", Journal of Cost Management, Vol. 6, Spring, 31-38.
- Fisher, Joseph, 1994, "Technological Interdependence, Labor Production Functions, and Control Systems", Accounting, Organisations and Society, Vol. 19, No. 6, 493-505.
- Fornell, Claes, Ittner, Christopher D., and Larcker, David F., 1996, "The Valuation Consequences of Customer Satisfaction", Unpublished working paper, The Wharton School, University of Pennsylvania, Philadelphia, PA.
- Frederick, David M. and Libby, Robert, 1986, "Expertise and Auditors' Judgements of Conjunctive Events", Journal of Accounting Research, Vol. 24, No. 2, 270-290.
- Galbraith, Jay, 1973, Designing Complex Organisations, Reading, MA: Addison-Wesley.
- Gjesdal, Froystein, 1981, "Accounting for Stewardship", Journal of Accounting Research, Vol. 19, No. 1, Spring, 208-231.
- Glaser, Robert, 1984, "Education and Thinking", American Psychologist, Vol. 39, No. 2, 93-104.
- Glisson, Charles A., 1978, "Dependence of Technological Routinization on Structural Variables in Human Service Organisations", Administrative Science Quarterly, Vol. 23, 383-395.
- Gordon, Lawrence A. and Miller, Danny, 1976, "A Contingency Framework for the Design of Accounting Information Systems", Accounting, Organisations and Society, Vol. 1, No. 1, 59-69.
- Gordon, Lawrence A. and Narayanan, V. K., 1984, "Management Accounting Systems, Perceived Environmental Uncertainty and Organisation Structure: An Empirical Investigation", Accounting, Organisations and Society, Vol. 9, No. 1, 33-47.

- Gosse, Darrel I., 1993, "Cost Accounting's Role in Computer-Integrated Manufacturing An Empirical Field Study", Journal of Management Accounting Research, Vol. 5, Fall, 159-179.
- Gosselin, Maurice, 1996, "The Effect of Strategy and Organisational Structure on the Adoption and Implementation of Activity-Based Costing", Working paper, Faculté des Sciences de l'Administration, Université Laval, Québec, Canada.
- Govindarajan, Vijay and Gupta, Anil K., 1985, "Linking Control systems to Business Unit Strategy: Impact on Performance", Accounting, Organisations and Society, Vol. 10, No. 1, 51-66.
- Govindarajan, Vijay, 1988, "A Contingency Approach to Strategy Implementation at the Business-Unit Level: Integrating Administrative Mechanisms with Strategy", Academy of Management Journal, Vol. 31, No. 4, 828-853.
- Gul, Ferdinand A. and Chia, Yew Ming, 1994, "The Effects of Management Accounting Systems, Perceived Environmental Uncertainty, and Decentralisation on Managerial Performance: A Test of Three-Way Interaction", Accounting, Organisations and Society, Vol. 19, No. 4, 413-426.
- Hage, Jerald and Aiken, Micheal, 1969, "Routine Technology, Social Structure, and Organisation Goals", Administrative Science Quarterly, Vol. 14, 366-376.
- Hambrick, Donald C. and D'Averni, Richard A., 1988, "Large Corporate Failures as Downward Spirals", Administrative Science Quarterly, Vol. 33, No. 1, 1-23.
- Hambrick, Donald C., 1983, "Some Tests of the Effectiveness and Functional Attributes of Miles and Snow's Strategic Types", Academy of Management Journal, Vol. 26, No. 1, 5-26.
- Hart, Stuart and Banbury, Catherine, 1994, "How Strategic-Making Processes can Make a Difference", Strategic Management Journal, Vol. 15, No. 4, 251-269.
- Hemmer, Thomas, 1996, "On the Design and Choice of Modern Management Accounting Measures", Journal of Management Accounting Research, Vol. 8, 87-116.
- Hopwood, Anthony G., 1972, "An Empirical Study of the Role of Accounting Data in Performance Evaluation", Journal of Accounting Research, Vol. 10, Supplement, 156-182.
- Howell, David C., 1992, "Statistical Methods for Psychology", Boston, MA.: PWS-KENT Publishing Company.
- Ijiri, Yuji, 1975, "Theory of Accounting Measurement", Studies in Accounting Research, No. 10, American Accounting Association, Sarasota, Florida.
- Ittner, Christopher D., Larcker, David F., and Rajan, Madhav V., 1995, "The Choice of Performance Measures in Annual Bonus Contracts", Unpublished Working Paper, The Wharton School, University of Pennsylvania, Philadelphia, PA.

- Jennings, Daniel F. and Seaman, Samuel L., 1994, "High and Low Levels of Organisational Adaptation: an Empirical Analysis of Strategy, Structure and Performance", Strategic Management Journal, Vol. 15, No. 6, 459-475.
- Johnson, H. Thomas and Kaplan, Robert S., 1987, Relevance Lost: The Rise and Fall of Management Accounting, Boston, MA: Harvard Business School Press.
- Johnson, Paul E., Duran, Alica S., Hassebrock, Frank, Moller, James, Prietula, Michael, Feltovich, Paul J., and Swanson David B., 1981, "Expertise and Error in Diagnostic Reasoning", Cognitive Science, Vol. 5, No. 3, 235-283.
- Kaplan, Robert S., 1984, "Yesterday's Accounting Undermines Production", Harvard Business Review, Vol. 62, July-August, 95-101.
- Kaplan, Robert S., 1994, "Management Accounting (1984-1994): Development of new practice and Theory", Management Accounting Research, Vol. 5, No. 3, 247-260.
- Kida, Thomas and Smith, James S., 1995, "The Encoding and Retrieval of Numerical Data for Decision-Making in Accounting Contexts: Model Development", Accounting, Organisations and Society, Vol. 20, No. 7, 585-610.
- Lawler, Edward E. III, 1976, "Control Systems in Organisations", Handbook of Industrial and Organisational Psychology, Chicago, IL: Rand McNally College Publishing Company, 1247-1291.
- Lawler, Edward E. III, 1987, "The Design of Effective Reward Systems", Handbook of Organisational Behaviour, Englewood Cliffs, N.J: Prentice Hall, 255-271.
- Lawrence, Paul R. and Lorsh, Jay W., 1967, Organisation and Environment, Boston, MA: Harvard University.
- Lebas, Michel, 1994, "Management Accountants: The Challenges of the Next Decade", from A View of Tomorrow Management Accountancy in the Year 2004, issued by the International Federation of Accountants, 35-53.
- Lebas, Michel, 1995, "The Tableau de Bord and Performance Management: the French Experience", Performance Indicator Systems Conference Proceedings, University of Waterloo, School of Accountancy, April, 18, 1995.
- Libby, Robert and Frederick, David M., 1990, "Experience and the Ability to Explain Audit Findings", Journal of Accounting Research, Vol. 28, No. 2, 348-367.
- Libby, Robert, 1985, "Availability and the Generation of Hypotheses in Analytical Review", Journal of Accounting Research, Vol. 23, No. 2, 648-667.
- Libby, Theresa, 1996, "The Incentive Effects of Fairness: A Study of the Effect of Perceived Fairness on Budgetary Slack and Performance", Doctoral dissertation, University of Waterloo, Ontario, Canada.

- Lord, Robert G. and Maher, Karen J., 1990, "Alternative Information-Processing Models and Their Implications for Theory, Research, and Practice", Journal of Management Review, Vol. 15, No. 1, 9-28.
- MacArthur, John B., 1996, "Performance Measures That Count: Monitoring Variables of Strategic Importance", Journal of Cost Management, Vol. 10, No. 3, 39-45.
- MacIntosh, Norman B. and Daft, Richard L., 1987, "Management Control Systems and Departmental Interdependencies: an Empirical Study", Accounting, Organisations and Society, Vol. 12, No. 1, 49-61.
- MacIntosh, Norman B., 1981, "A Contextual Model of Information Systems", Accounting, Organisations and Society, Vol. 6, No. 1, 39-53.
- Mangaliso, Mzamo P., 1995, "The Strategic Usefulness of Management Information as Perceived by Middle Managers", Journal of Management, Vol. 21, No. 2, 231-250.
- Manzoni, Jean-François, 1994, "Use of Quantitative Feedback by Superiors of Manufacturing Cost Center Managers: A Field Study", Unpublished working paper, INSEAD, Fontainebleau, Cedex, France.
- March James G. and Simon, Herbert A., 1958, Organisations, New York, NY: Wiley.
- Matlin, Margaret W., 1989, Cognition, New York, NY: Harcourt Brace Jovanovich College Publishers.
- Merchant, Kenneth A., Chow, Chee W., and Wu, Anne, 1995, "Measurement, Evaluation, and Reward of Profit Center Managers: A Cross-Cultural Field Study", Accounting, Organisations, and Society, Vol. 20, No. 7, 619-638.
- Mia, Lokman and Chenhall, Robert H., 1994, "The Usefulness of Management Accounting Systems, Functional Differentiation, and Managerial Effectiveness", Accounting, Organisations and Society, Vol. 19, No. 1, 1-13.
- Miles, Matthew B. and Huberman, A. Michael, Qualitative Data Analysis: An Expanded Sourcebook, Thousand Oaks, Ca: Sage Publications, Inc.
- Miles, Raymond E. and Snow, Charles C., 1978, Organisational Strategy, Structure, and Process, New York, NY: McGraw-Hill Co.
- Miles, Raymond E. and Snow, Charles C., Meyer, Alan D., and Coleman, Henry J. Jr., 1978, "Organisational Strategy, Structure and Process", Academy of Management Review, July, Vol. 3, No. 3, 546-562.
- Miller, Danny and Friesen, Peter H., 1982, "Innovation in Conservative and entrepreneurial Firms: Two Models of Strategic Momentum", Strategic Management Journal, Vol. 3, No. 1, 1-25.

- Miller, Georges A., 1956, "The Magical number Seven, plus or minus two: Some Limits on our capacity for processing Information", Psychological Review, Vol. 63, No. 2, 81-97.
- Milliken, Frances J., 1987, "Three Types of Perceived Uncertainty about the Environment: State, Effect, and Resource Uncertainty", Academy of Management Review, Vol. 12, No. 1, 133-143.
- Mintzberg, Henry, 1973, "The Nature of Managerial Work", New York, NY: Harper & Row, Publishers, Inc.
- Mintzberg, Henry, 1978, "Patterns in Strategy Formulation", Management Science, Vol. 4, No. 9, 934-949.
- Mintzberg, Henry, 1989, "Mintzberg on Management: Inside our Strange World of Organisations", New York, NY: The Free Press.
- Mintzberg, Henry and Waters, James A., 1982, "Tracking Strategy in an Entrepreneurial Firm", Academy of Management Journal, Vol. 25, No. 3, 465-499.
- Nanni, Alfred J. Jr., Dixon, J. Robb, and Vollmann, Thomas E., 1990, "Strategic Control and Performance Measurement", Journal of Cost Management, Vol. 4, Summer, 33-42.
- Newell, Allen and Simon, Herbert A., 1972, Human Problem Solving, Englewood Cliffs, N.J.: Prentice-Hall Inc.
- Nisbett, Richard and Ross, Lee, 1980, Human Inference: Strategies and Shortcomings of Social Judgment, Englewood Cliffs, N.J.: Prentice-Hall.
- Norburn, David and Birley, Sue, 1988, "The Top Management Team and Corporate Performance", Strategic Management Journal, Vol. 9, No. 3, 225-237.
- Nunnally, Jum C., 1978, Psychometric Theory, New York, N.Y.: McGraw-Hill.
- O'Keefe John and Nadel, Lynn, 1978, The Hippocampus as a Cognitive Map, Oxford, England: Clarendon Press.
- Otley, David, 1994, "Management Control in Contemporary Organisations: Toward a Wider Framework", Management Accounting research, Vol. 5, No. 3, 289-299.
- Ouchi, William G., 1979, "A Conceptual Framework for the Design of Organisational Control Mechanisms", Management Science, Vol. 25, No. 9, 833-848.
- Parthasarthy, Raghavan and Sethi, S. Prakash, 1992, "The Impact of Flexible Automation an Business Strategy and Organisational Structure", Academy of Management Review, Vol. 17, No. 1, 86-111.
- Pavlik, Ellen L., Scott, Thomas W., and Tiessen, Peter, 1993, "Executive Compensation: Issues and Research", Journal of Accounting Literature, Vol. 12, 131-189.

- Payne, John W., 1982, "Contingent Decision Behaviour", Psychological Bulletin, Vol. 92, No. 2, 382-402.
- Pedhazur, Elazar J., 1982, "Multiple Regression in Behavioral Research: Explanation and Prediction", Fort Worth, TE.: Harcourt Brace Jovanovich, Inc.
- Perrow, Charles, 1967, "A Framework for Comparative Organisational Analysis", American Sociological Review, Vol. 32, No. 2, 194-208.
- Porter, Michael E., 1980, Competitive Strategy: Techniques for Analysing Industries and Competitors, New York, N.Y.: The Free Press.
- Porter, Michael E., 1985, Competitive Advantage: Creating and Sustaining Superior Performance", New York, N.Y.: The Free Press.
- Rockart, John F., 1979, "Chief Executives Define Their Own Data Needs", Harvard Business Review, Vol. 57, March-April, 81-90.
- Rosman, Andrew, Lubatkin, Michael, and O'Neill, Hugh, 1994, "Rigidity in Decision Behaviours: A Within-subject Test of Information Acquisition using Strategic and Financial Informational Cues", Academy of Management Journal, Vol. 37 No. 4, 1017-1033.
- Schroder, Harold M., Driver, Michael J., and Streufert, Siegfried, 1967, Human Information Processing, New-York, N.Y.: Holt, Rinchart, and Winston.
- Schwenk, Charles R., 1995, "Strategic Decision Making", Journal of Management, Vol. 21, No. 3, 471-493.
- Segev, Eli, 1989, "A Systematic Comparative Analysis and Synthesis of Two Business-Level Strategic Typologies", Strategic Management Journal, Vol. 10, No. 5, 487-505.
- Shortell Stephen M. and Zajac, Edward J., 1990, "Perceptual and Archival Measures of Miles and Snow's Strategic Types: A Comprehensive Assessment of Reliability and Validity", Academy of Management Journal, Vol. 33, No. 4, 817-822.
- Siegel, Sidney and Castellan, N. John Jr., 1988, Nonparametric Statistics for the Behavioural Sciences, New York, N.Y.: McGraw-Hill, Inc.
- Simon, Herbert A., Guetzkow, Harold, Kozmetsky, George, and Tyndall, Gordon, 1954, Centralisation vs Decentralisation in Organising the Controller's Department, New York, N.Y.: Controllershship Foundation.
- Simon, Herbert A., 1955, "A Behavioural Model of Rational Choice", Quarterly Journal of Economic, Vol. 69, 99-118.
- Simons, Robert, 1987, "Accounting Control Systems and Business Strategy", Accounting, Organisations and Society, Vol. 12, No. 4, 357-374.

- Simons, Robert, 1990, "The Role of Management Control Systems in Creating Competitive Advantage: New Perspective", Accounting, Organisations and Society, Vol. 15, No. 1, 127-143.
- Slovic, Paul and Lichtenstein, Sarah, 1971, "Comparison of Bayesian and Regression Approach to the Study of Information Processing in Judgment", Organisational Behaviour and Human Performance, Vol. 6, 649-744.
- Slovic, Paul, 1969, "Analysing the Expert Judge: A Descriptive Study of a Stockbroker's Decisions Processes", Journal of Applied Psychology, Vol. 53, No. 4, 255-263.
- Souder, William E. and Moenaert, Rudy K., 1992, "Integrating Marketing and R&D Project Personnel Within Innovation Projects: An Information Uncertainty Model", Journal of Management Studies, Vol. 29, No. 4, 485-512.
- Tabachnick, Barbara G. and Fidell, Linda S., 1989, Using Multivariate Statistics, New York, N.Y.: Harper Collins Publishers, Inc.
- Thomas, Anisya S., Litschert, Robert J., and Ramaswamy, Kannan, 1991, "The Performance Impact of Strategy-Manager Coalignment: An Empirical Examination", Strategic Management Journal, Vol. 12, No. 7, 509-522.
- Thompson, James D., 1967, Organisations in Action, New York, N.Y.: McGraw-Hill.
- Ungson, Gerardo R. and Braunstein, Daniel N., 1982, Decision-Making: An Interdisciplinary Inquiry, Boston, MA: Kent Publishing Company.
- Veliyath, Rajaram and Shortell, Stephen M., 1993, "Strategic Orientation, Strategic Planning Systems Characteristics and Performance", Journal of Management Studies, Vol. 30, No. 3, 359-381.
- Victor, B. and Blackburn, R. S., 1987, "Determinants and Consequences of Task Uncertainty: a Laboratory and Field Investigation", Journal of Management Studies, Vol. 24, No. 4, 387-403.
- Waller, Mary J., Huber, George P., and Glick, William H., 1995, "Functional Background as a Determinant of Executives' Selective Perception", Academy of Management Journal, Vol. 38, No. 4, 943-974.
- Walsh, James P., 1988, "Selectivity and Selective Perception: An Investigation of Managers' Belief Structures and Information Processing", Academy of Management Journal, Vol. 31, No. 4, 873-896.
- Walsh, James P., 1995, "Managerial and Organisational Cognition: Notes from a Trip Down Memory Lane", Organisation Science, Vol. 6, No. 3, 280-321.
- Waterhouse, John H. and Tiessen, Peter, 1978, "A Contingency Framework for Management Accounting Systems Research", Accounting, Organisations and Society, Vol. 3, No. 1, 65-76.

- Whittington, Ray and Margheim, Loren, 1993, "The Effects of Risk, Materiality, and Assertion Subjectivity on External Auditors' Reliance on Internal Auditors", Auditing: A Journal of Practice & Theory, Vol. 12, No. 1, 50-64.
- Withey, Michael, Daft, Richard L., and Cooper, William H., 1983, "Measures of Perrow's Work Unit Technology: An Empirical Assessment of a New Scale", Academy of Management Journal, Vol. 26, No. 1, 45-63.
- Yin, Robert K., 1994, Case Study Research: Design and Methods, Thousand Oaks, CA.: Sage Publications, Inc.
- Yasai-Ardekani, Masoud and Nystrom, Paul C., 1996, "Designs for Environmental Scanning Systems: Tests of a Contingency Theory", Management Science, Vol. 42, No. 2, 187-204.
- Young, Mark S., Fisher, Joseph, and Lindquist, Tim M., 1993, "The Effects of Intergroup Competition and Intragroup Cooperation on Slack and Output in a Manufacturing Setting", The Accounting Review, Vol. 68, No. 3, 466-481.
- Zahra, Shaker A. and Covin, Jeffrey G., 1993, "Business Strategy, Technology Policy and Firm Performance", Strategic Management Journal, Vol. 14, No. 6, 451-478.
- Zahra, Shaker A. and Pearce II, John A., 1990, "Research Evidence on the Miles-Snow Typology", Journal of Management, Vol. 16, No. 4, 751-768.