AN EMPIRICAL EXAMINATION OF THE RELATIONSHIP BETWEEN BUSINESS PROCESS MANAGEMENT AND BUSINESS PERFORMANCE: A STUDY OF AUSTRALIA'S TOP 1000 COMPANIES

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An Empirical Examination of the Relationship between Business Process Management and Business Performance: A study of Australia's Top 1000 Companies

by

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ABSTRACT

An Empirical Examination of the Relationship between
Business Process Management and Business Performance:
A Study of Australia's Top 1000 Companies.

Business Process Management (BPM) is a disciplined and structured approach to managing a company's core processes. Its aim is to coordinate, as efficiently and effectively as possible, the many activities a company must perform to deliver the products and services to its customers. BPM represents a shift from the out-dated command-and-control or functional style of management to a flatter, more horizontal style based on empowered process teams. While BPM is the action of many companies, it is a relatively new field of empirical research.

This thesis addresses the question – do companies that increase their adoption of the basic tenets of BPM increase their performance? These tenets are: 1) a willingness to create synergies between organisational structure, strategic management, IT systems, and core processes, 2) the successful adoption of disciplined approaches to process improvement, and 3) the involvement of people at all levels in the management of end-to-end processes. Based on 260 responses from Australia's top 1000 companies and perception data from CEO's and MD's, the answer is that companies do achieve higher levels of performance the more capable they are at BPM. The three tenets of BPM, however, contribute in different ways to performance improvement.

This thesis builds a research model to explain the relationships between the tenets of BPM and organisational performance. It develops and operationalises several new constructs and variables that contribute to research on BPM. These include Process Management Capability, Process Alignment, Process Improvement Competency, and People Involvement. The thesis develops and tests 13 research hypotheses. Correlation Analysis, Elaboration Analysis and Multiple Linear Regression are used extensively.

This thesis confirms several existing research findings and presents some new results. The major findings are:

1. The more effort companies place individually on the basic tenets of BPM the better they perform. If these efforts are generated simultaneously, performance is significantly further enhanced.

2. There is an empirical cause-and-effect mechanism that relates the basic tenets of BPM to each other and organisational performance. This thesis describes this mechanism.

3. This mechanism suggests that it is strong leadership and employee empowerment that create synergies between structure, strategy, IT and core processes. They also increase the success rate of the three common process improvement initiatives: Continuous Improvement, Business Process Reengineering and Benchmarking. Collectively, there is an increase in organisational performance.

4. The effect of being more capable at BPM is to improve the performance of each of the six core processes that are common to many companies.

5. Australia's top 1000 companies, at least according the perceptions of their leaders (CEO's and MD's), are practising the basic tenets of BPM. There is, however, still considerable room for improvement.

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TABLE OF CONTENTS

		Page
ABSTRACT		iii
ACKNOWLEDGEMENT		v
LIST OF FIGURES		xiii
LIST OF TABLES		xv
CHAPTER 1	INTRODUCTION	1
1.1	Introduction	1
1.2	Purpose of the research	6
1.3	Rationale of the research	6
1.4	Scope of the research	13
1.5	Significance of the study	13
1.6	Organisation of the thesis	15
CHAPTER 2	THEORETICAL FOUNDATION	18
2.1	Business Process Management	18
	2.1.1 Definition and Principles of Business Process Management	20
	2.1.2 Reasons Why Organisations Adopt Business Process Management	25
	2.1.3 Benefits of Business Process Management	26
	2.1.4 Concept and Classifications of Business Process	29
2.2	Organisational Structure	35
	2.2.1 Types of Traditional Organisational Structures	36
	2.2.2 Advantages and Disadvantages of Each Type of Organisational Structure	41
	2.2.3 Horizontal Organisation	44
	2.2.3.1 Benefits of the Horizontal Organisation	46
	2.2.3.2 Role of the Process Owner in a Horizontal Organisation	46

2.3	Strategic Management	48
	2.3.1 Market-Based View	50
	2.3.1.1 Value Chain Model	50
	2.3.1.2 Generic Competitive Strategies	51
	2.3.2 Resource-Based View	53
	2.3.2.1 Strategic Intent	53
	2.3.2.2 Core Competence	54
	2.3.3 Link Between Business Process Management and Strategic Management	56
2.4	Information Technology	57
	2.4.1 Definitions and Roles of Information Technology	58
	2.4.2 Opportunities for Information Technology	60
	2.4.3 IT as an enabler of Business Process Management	61
2.5	Process Improvement	63
	2.5.1 Continuous Improvement	64
	2.5.1.1 Definitions and Characteristics of Continuous Improvement	64
	2.5.1.2 Benefits of Continuous Improvement	66
	2.5.2 Benchmarking	67
	2.5.2.1 Definitions and Characteristics of Benchmarking	67
	2.5.2.2 Benefits of Benchmarking	69
	2.5.3 Process Reengineering	70
	2.5.3.1 Definitions and Characteristics of Process Reengineering	71
	2.5.3.2 Benefits of Process Reengineering	73
	2.5.4 Critical Success Factors for Process Improvement	74
2.6	Performance Measurement Systems	77
2.7	Relationship to the Research	79

CHAPTER 3 RESEARCH MODEL AND HYPOTHESES 82

3.1 Research Model Development 82

3.2 Variables in the Research Model 86

3.2.1 Independent variables 86

3.2.1.1 Process Alignment (PALI) 86

3.2.1.2 People Involvement (PINV) 87

3.2.1.3 Process Improvement Competency (PICO) 88

3.2.1.4 The Construct – Process Management Capability (PMC) 88

3.2.2 Dependent variables 89

3.2.2.1 Organisational Performance (OPER) 89

3.2.2.2 Core Process Performance (CPP) 89

3.3 Research Hypotheses 90

3.3.1 Hypothesis 1 to Hypothesis 4 90

3.3.1.1 Hypothesis 1: Process Alignment and Organisational Performance 90

3.3.1.2 Hypothesis 2: People Involvement and Organisational Performance 93

3.3.1.3 Hypothesis 3: Process Improvement Competency and Organisational Performance 95

3.3.1.4 Hypothesis 4: Process Management Capability and Organisational Performance 98

3.3.2 Hypothesis 5 to Hypothesis 7 99

3.3.3 Hypothesis 8 to Hypothesis 13 101

3.4 Summary 102

CHAPTER 4	EMPIRICAL SURVEY DESIGN	104
4.1	Research design	104
	4.1.1 General Purposes of the Research	105
	4.1.2 Research Hypotheses	106
	4.1.3 Unit of analysis	108
	4.1.4 The Time Dimension	109
	4.1.5 Method of Data Collection	109
	4.1.6 Validity and Reliability	110
4.2	Survey Design Issues	111
	4.2.1 Population for the Survey	111
	4.2.2 Key Informant	112
	4.2.3 Response Rate Required	113
4.3	Instrument development and operationalisation	116
	4.3.1 Process Alignment	121
	4.3.2 People Involvement	122
	4.3.3 Process Improvement Competency	123
	4.3.4 Business Performance	126
4.4	Survey Instrument Pilot Testing	128
4.5	Survey Administration and Data Collection	129
4.6	Measurement Scales and Statistical Methods for Data Analysis	131
	4.6.1 Measurement Scales	132
	4.6.2 Correlation Analysis	134
	4.6.3 Multiple Linear Regression	136
	4.6.4 The Analysis of Interaction Effects	138
	4.6.5 Elaboration Analysis	139
4.7	Summary	143

CHAPTER 5 PRELIMINARY DATA ANALYSIS 144
5.1 Response profile 144
5.2 Non-response bias 147
5.3 Responding company profile 149
5.3.1 Type of industry 149
5.3.2 Years in Business 150
5.3.3 Total Number of Employees 151
5.3.4 Annual Sales Volume 151
5.3.5 The Use of Outsourcing 152
5.3.6 The Implementation of the Balanced Scorecard 153
5.4 Respondent profile 155
5.4.1 Position of Respondent in Company 155
5.4.2 Request for summary of Research Findings 156
5.5 Process Improvement Profile 157
5.5.1 Process Improvement activities conducted 157
5.5.2 Process Improvement Activities by Industry 159
5.6 Assessment of validity 160
5.6.1 External Validity 160
5.6.2 Internal Validity 161
5.6.2.1 Content Validity 161
5.6.2.2 Construct Validity 162
5.7 Assessment of Reliability 170
5.8 Profile of Process Alignment, Process Improvement Competency and People Involvement at component Level 172
5.9 Summary 175

CHAPTER 6 DATA ANALYSIS 176
6.1 Exploratory Data Analysis 177
6.2 Confirmation of Component Level Results 180
6.3 Mechanism of PALI, PICO and PINV on OPER 182

6.4	The Association of PALI, PICO, PINV and PMC on OPER (Testing Research Hypothesis 1 to Hypothesis 4)	203
6.5	Interaction Effects of PALI, PICO and PINV on OPER	205
	6.5.1 Testing Research Hypothesis 5	205
	6.5.2 Testing Research Hypothesis 6	208
	6.5.3 Testing Research Hypothesis 7	210
6.6	Association between PMC and CPP	211
	6.6.1 Testing Research Hypothesis 8	212
	6.6.2 Testing Research Hypothesis 9	213
	6.6.3 Testing Research Hypothesis 10	213
	6.6.4 Testing Research Hypothesis 11	214
	6.6.5 Testing Research Hypothesis 12	214
	6.6.6 Testing Research Hypothesis 13	215
6.7	Summary	215
CHAPTER 7	FINDINGS AND DISCUSSION	217
7.1	Process Alignment	218
	7.1.1 Process Alignment – Its Components	218
	7.1.2 Process Alignment – As an Aggregate Variable	219
7.2	Process Improvement Competency	221
	7.2.1 Process Improvement Competency – Its Components	221
	7.2.2 Process Improvement Competency - As an Aggregate Variable	222
7.3	People Involvement	224
	7.3.1 People Involvement - Its Components	224
	7.3.2 People Involvement - As an Aggregate Variable	225
7.4	Two-way Interactions of Process Alignment, Process Improvement Competency and People Involvement on Organisational Performance	227

7.5 Process Management Capability 229
7.5.1 Organisational Performance 230
7.5.2 Core Process Performance 230
7.6 Summary 233

CHAPTER 8 CONCLUSIONS 236
8.1 Summary of the research 236
8.2 Limitations of the research 245
8.3 Other Contributions of the research 247
8.4 Implications for practice 248
8.5 Directions for future research 249

REFERENCES 252

APPENDICES
Appendix A Preliminary opinion questionnaire 277
Appendix B Framework for questionnaire design 278
Appendix C Definition of variables and terms 279
Appendix D Questionnaire package 281
D.1 Cover letter 281
D.2 Questionnaire 282
Appendix E Exploratory data analysis 292
E.1 Normality check of variables 292
E.2 Independence check of variables 298
E.3 Linearity check of variables 300
Appendix F Multiple Linear Regression diagnostic check 302

LIST OF FIGURES

Figure	Title	Page
2.1	The generic Value Chain Model	51
2.2	Three generic strategies	52
2.3	Emergence of a strategic role for IT in organisations	59
2.4	Business Process Change Model	62
3.1	The Research Model: the relationship between Process Management Capability and Business Performance	85
5.1	Type of industry for the responding companies	149
5.2	Years in business for the responding companies	150
5.3	The number of employees in the responding companies	151
5.4	Annual sales volume for the responding companies	152
5.5	Process Improvement activities	158
6.1	Possible relationships in Elaboration Analysis of PALI, PICO and PINV on OPER	183
6.2	Correlations between PALI and OPER, PICO and OPER, PINV and OPER, PALI and PICO, PINV and PICO, and PINV and PALI	185
6.3	Model I	185
6.4	Model II	186
6.5	Model III	188
6.6	Model IV	189
6.7	Model V	191
6.8	Model VI	192
6.9	Model VII	193
6.10	Model VIII	194
6.11	Model IX	196
6.12	Model X	197
6.13	Model XI	200
6.14	Model XII	201

6.15	Correlation between PMC and OPER	204
6.16	Correlation from PMC to PDCN, PMC to MCCE, PMC to DNPC, PMC to PPSC, PMC to PBCU, and PMC to PASS	212
8.1	BPM mechanism	240

LIST OF TABLES

Table	Title	Page
2.1	Classification of business processes according to different scholars	34
4.1	Research hypotheses	107
4.2	Operationalisation of variables and components	118
5.1	Response profile	145
5.2	Response rate of surveys in Business Process Management	145
5.3	Reason for questionnaire return unfilled	146
5.4	Analysis of non-response bias	148
5.5	The use of Outsourcing in the responding companies	153
5.6	The implementation of Balanced Scorecard in the responding companies	154
5.7	The impact of the implementation of Balanced Scorecard on the improvement of organisational performance	154
5.8	Position of respondents from the responding companies	156
5.9	Summary of respondents requesting research findings	157
5.10	Process improvement initiatives by industry	160
5.11	Factor analysis with varimax rotation	164
5.12	Item-total correlation	169
5.13	Scale reliability measures	171
5.14	Ratings for Process Alignment at component level	172
5.15	Ratings for Process Improvement Competency at component level	173
5.16	Ratings for People Involvement at component level	174
6.1	Number of observations for each variable and its components	179
6.2	Correlation coefficient and significant levels between components of Independent variables: PALI, PICO, PINV and dependent variable: OPER	181
6.3	Regression of PICO and PINV on PALI	200
6.4	Regression of PALI and PINV on PICO	202
6.5	Regression of PALI, PICO, PINV and its interactions on OPER	206

6.6	Regression of PALI and PALI*PICO on OPER	207
6.7	Regression of PALI*PICO, PALI*PINV and PINV*PICO on OPER	209
6.8	Summary of results of hypotheses testing	216
7.1	Relationships between Process Alignment and Organisational Performance	220
7.2	Relationships between Process Improvement Competency and Organisational Performance	223
7.3	Relationships between People Involvement and Organisational Performance	226

CHAPTER 1

INTRODUCTION

1.1 Introduction

Since the mid-80's, the intensity of business competition has increased significantly. The growth of new economic blocks such as the European Economic Community, North Atlantic Free Trade Association, Asian Pacific Economic Council, the shift toward a market economy in eastern Europe, Russia, China, Vietnam, and the ratification of the General Agreement on Tariff and Trade, has forced many companies to search for new ways to gain competitive advantage (Peters, 1990). According to Daly and Freeman (1997), organisations are facing intense and relentless challenges to their survival. These challenges are: (1) a rapidly accelerating rate of technological change; (2) increasing expectations of customers; (3) international quality and environmental standards; and (4) increasing employee demand for more autonomy.

In the past, most businesses have traditionally been structured around functional units (eg. Marketing, Finance, Operations, Human Resource etc) with activities carried out by departments. This type of organisational structure is referred to as a vertical or silo structure. The management style is typically command and control. Managing change is usually managed department by department (Perrow, 1986). In a vertical management approach, problems often arise in the interaction between departments. This leads to inefficiencies and restricts an organisation's ability to respond to change and maintain a competitive edge (Clegg, 1992; Kanter and Buck 1985; Quinn Mills 1991).

Peters (1987) and Naisbitt and Aburdene (1990) asserted that the command and control style of management engrained in the vertical organisation, no matter how useful in the past, was unsustainable. They were supported by Hammer (1990). Hammer stated that finding themselves faced with unrelenting global competition and more powerful and demanding customers, organisations came to realise that inflexible modes of operation were no longer adequate. The imperative for top level managers was to rethink and search for ways in which their businesses could remain competitive (Peters, 1990).

Organisations responded to increased competition and change by paying more attention to the way their end-to-end processes performed. They introduced process improvement programs. In the United States, Continuous Improvement programs that focused on customers and in particular on small step improvement, were introduced in early 1980's (Kelada, 1994; Zairi and Sinclair, 1995). This was then followed by Benchmarking programs in the late 1980's that searched for the best practices which would lead to superior performance (Camp, 1989).

Process Reengineering emerged in the 1990's. It involves the radical redesign of business processes to achieve dramatic improvement in organisational performance

(Davenport and Short, 1990; Hammer, 1990). According to CSC Index (1994), however, seventy percent of Process Reengineering projects do not achieve the dramatic result they intended. Many other scholars reported a fifty to seventy percent failure rate of Process Reengineering projects (Hammer and Champy, 1993; Murphy, 1994; Murray, 1993; Stewart, 1993). Process Reengineering was not the total solution.

Hammer (1996) stated that "The shape of the twenty-first century company is becoming clear. It will be organised around processes rather than functions. Managers will coach and design rather than supervise and control. Employees will be process performers rather than task workers with a broad understanding of their process and their company. ...... Change will be expected not feared. ...... Companies that cling to traditional hierarchical structures and bureaucratic systems will simply not be able to compete against their process-centered counterparts" (Hammer, 1996, p258). Hammer concluded that the organisation must place the emphasis on "processes" rather than on "radical change".

The emphasis on better managing business processes has also been highlighted by many authors: Bartlett and Ghoshal (1990), Charan (1991), Drucker (1992), Handy (1989), Kanter (1983), Kilmann (1995), and Kilmann and Covin (1988).

The transition from a mindset of radically changing business processes to a mindset of daily management of processes with the options of small-step or radical change evolved to become the concept of Business Process Management (BPM). Business Process Management focuses on an integrated approach to core processes. Core processes describe the end-to-end work that an organisation does for the benefit of its customers. Core processes are processes that cross-functional boundaries, produce an output that is strategically important to the organisation's success, and have a high impact on customer satisfaction (DeToro and McCabe, 1997). Business Process Management entails a set of practices that place the emphasis on aligning strategy, structure and information technology with processes. Business Process Management also emphasises people involvement, top executive commitment and process improvement programs. It places a strong emphasis on quality and customer satisfaction.

Business Process Management is a disciplined and structured approach to managing an organisation that identifies processes, places them in hierarchical significance and assigns process owners. Processes are separated into those that address the needs of customers (eg. ordering and dispatch), and those that address the needs of the enterprise (eg. accounting, human resource management). Improvement initiatives are achieved by breaking down large processes, working on smaller sub-processes and treating processes not always as workflow but as "invisible economic assets and liabilities" (Keen and Knapp, 1996, p11).

A major aim of Business Process Management is to ensure that the critical activities affecting customer satisfaction are executed in the most efficient and effective manner. Well-managed processes reduce cost and increase customer loyalty. Strategic improvement plans are undertaken based on a process not a functional view.

There are two schools of thought that propose links between Business Process Management and Total Quality Management. In the first school of thought, Business Process Management is considered a more holistic approach to performance management than Total Quality Management. Total Quality Management is seen as small step change and a set of problem solving tools (Boardman, 1997; Keen and Knapp, 1996; Zairi, 1997). Total Quality Management is not considered to have the same performance emphasis as Business Process Management with regard to strategic management. In the second school of thought, Total Quality Management is considered a holistic approach that includes Continuous Improvement, Process Reengineering, Benchmarking and strategic management (Ross, 1993). The first school of thought was adopted in this study.

Business Process Management encompasses many of today's change programs. Initiatives within Business Process Management include: Continuous Improvement, Benchmarking, Process Reengineering, Key Performance Indicators, Self-Managed Work Teams, Organisational Self-Assessment and Strategic Plan Deployment (Elzinga et al., 1995; Harrington, 1991; Keen and Knapp, 1996). According to DeToro et al. (1997), these initiatives have been more widely recognised individually than as part of an overall management approach.

In recent years, there has been an appreciation that no one performance improvement initiative meets every need. A combination of initiatives is required, even when addressing a single process. Business Process Management recognises this and presents a comprehensive array of initiatives from small step to large step for the improvement of business processes (DeToro and McCabe, 1997; Elzinga et al., 1995).

Business Process Management advocates that the type of initiative is contingent upon the context. To date, Business Process Management is still a relatively new field and knowledge of its concepts and extent of its practice are limited (Lee and Dale, 1998).

1.2 Purpose of the Research

Based on the literature review described later, this thesis develops a model that relates how well organisations manage their core processes to how well they perform. At one extreme organisations may manage their core processes in an ad hoc manner. At the other extreme they may adopt a disciplined approach, following the principles of Business Process Management. It is proposed that where organisations sit in this continuum will affect their performance.

The purpose of this research is (1) to build a research model that captures the relationships between the tenets of Business Process Management and organisational performance, (2) to develop and operationalises several new constructs and variables that contribute to our understanding of Business Process Management, and (3) to propose and test research hypotheses based on the model.

1.3 Rationale of the Research

Business Process Management requires organisations to adopt a disciplined approach to:

(1) Creating alignment between the elements of the organisation and process. These elements are structure, strategy and information technology (adapted from Scott-Morton, 1991; Yetton and Johnston, 1993);

(2) Involving people at all levels in the management of processes; and

(3) Adopting a disciplined approach to process improvement.

This thesis proposes that an organisation adept at managing all three will show superior business performance.

How well an organisation manages the fit between its processes and its elements is captured by the variable Process Alignment. Process Alignment can be interpreted as the organisational effort needed to make processes the platform for organisational structure, for strategic planning, and for information technology (adapted from Hammer, 1996; Spector, 1995). Process Alignment consists of three components: horizontalism, strategy alignment and information technology alignment.

How well an organisation involves people at all levels in the management of its processes is captured by the variable People Involvement. People Involvement is measured as the extent of active participation of all members of an organisation in decision-making and problem-solving. It consists of sponsorship and support from top level management and the realignment of power, knowledge, and information to the lower levels in the organisation (adapted from Bounds et al., 1994; Keen and Knapp, 1996; Pace, 1989). People Involvement consists of two components: executive commitment and employee empowerment.

How well an organisation undertakes process improvement programs is captured by the variable Process Improvement Competency. Process Improvement Competency is measured as the extent of an organisation's capability in successfully implementing process improvement initiatives. Capability is a measure of both duration and success. Process improvement initiatives include Continuous Improvement, Process Reengineering and Benchmarking (adapted from Hammer and Champy, 1993; Hunt, 1996; Spendolini, 1992; Suryo, 1999; Zairi, 1996). Process Improvement Competency is the aggregate of an organisation's capabilities in implementing Continuous Improvement, Process Reengineering and Benchmarking.

This thesis develops and operationalises a construct - Process Management Capability - that combines the variables Process Alignment, People Involvement and Process Improvement Competency. Thus, Process Management Capability represents how well an organisation practises Business Process Management. An organisation, which has a high Process Management Capability, is expected to show superior business performance. This thesis specifically tests this proposition.

Adapted from Rummler and Brache (1995), there are two levels of business performance: the organisational level of performance and the process level of performance. The organisational level of performance measures performance in a holistic way, according to the expectations of external stakeholders. These may include owners, investors, customers, regulators, and society. The process level of performance is the extent to which an organisation ensures that its core processes meet customer needs and work efficiently. This thesis nominates six core processes to study the process level of performance. The names of these six core processes are adapted from the International Benchmarking Clearinghouse (1995) and Arthur Andersen (1998). They are: (1) the process for determining customer needs; (2) the process for monitoring changes in customer expectations; (3) the process for designing new products and services; (4) the process for providing products and services to customers; (5) the process for billing customers; and (6) the process for providing after-sales services.

This thesis will empirically examine the relationship of the construct Process Management Capability and its variables - Process Alignment, People Involvement, and Process Improvement Competency - to both levels of business performance – the organisational level and the process level. The content is Australia's Top 1000 companies. In Chapter 3, a variable - Organisational Performance - is formed to represent organisational level of performance and a variable - Core Process Performance - is formed to represent performance of each of the six core processes.

In the literature, there are several previous studies on Business Process Management. They are limited in scope and tend to be descriptive (Armistead and Machin, 1997; Corrigan, 1996; DeToro and McCabe, 1997; Elzinga et al., 1995; Hinterhuber, 1995; McCormack, 1999; Prior-Smith and Perrin, 1996; Zairi, 1997). Moreover, there is no empirical study that: (1) relates Process Management Capability to Organisational Performance; (2) relates Process Management Capability to Core Process Performance; (3) examine the mechanism that describes the relationship of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance; and (4) relates Process Alignment, People Involvement and Process Improvement Competency to Organisational Performance.

The relationship between the components of Process Alignment (Horizontalism, Strategy Alignment, and IT Alignment) and Organisational Performance have been empirically investigated (Coleman, 1991; Gagnon and Dragon, 1998; Hinterhuber, 1995; Snowden, 1991; Powell and Dent-Micallef, 1997; Zairi, 1997). The relationship between the components of People Involvement (Executive Commitment and Employee Empowerment) and Organisational Performance have been empirically investigated (Arthur, 1994; Garvin, 1988; Huselid, 1995; Kallenberg and Moody, 1994; Powell, 1995). The relationship between the components of Process Improvement Competency (Continuous Improvement Competency, Process Reengineering Competency, and Benchmarking Competency) and Organisational Performance also have been empirically investigated (Brocka and Brocka, 1992; Camp, 1989; Davenport, 1993b; Hammer and Champy, 1993). However, the majority of these studies have not been undertaken in Australia. This thesis examines whether the results of overseas studies can be confirmed in the case of Australia's Top 1000 companies.

The above discussion can be summarised through the six research questions developed in this thesis:

(1) Does the relationship between a) the components of Process Alignment and Organisational Performance, b) the components of People Involvement and Organisational Performance, and c) the components of Process Improvement Competency and Organisational Performance hold true in Australia?

(2) What is the relationship between Process Management Capability and Organisational Performance?

(3) What is the relationship between Process Management Capability and Core Process Performance for each of these six core processes?

(4) What is the mechanism describing the relationship of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance?

(5) What is the relationship of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance?

(6) Are there interaction effects of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance?

The first research question seeks to confirm that the following relationships established mainly with US and UK data also hold in Australia:

1 Horizontalism is positively associated with Organisational Performance

2 Strategy Alignment is positively associated with Organisational Performance

3 Information Technology Alignment is positively associated with Organisational Performance

4 Executive Commitment is positively associated with Organisational Performance

5 Employee Empowerment is positively associated with Organisational Performance

6 Continuous Improvement Competency is positively associated with Organisational Performance

7 Process Reengineering Competency is positively associated with Organisational Performance

8 Benchmarking Competency is positively associated with Organisational Performance

The other five research questions lead to thirteen hypotheses:

- H 1 Process Alignment is positively associated with Organisational Performance
- H 2 People Involvement is positively associated with Organisational Performance
- H 3 Process Improvement Competency is positively associated with Organisational Performance
- H 4 Process Management Capability is positively associated with Organisational Performance
- H 5 There is a positive interaction between Process Alignment and Process Improvement Competency on Organisational Performance
- H 6 There is a positive interaction between Process Alignment and People Involvement on Organisational Performance
- H 7 There is a positive interaction between People Involvement and Process Improvement Competency on Organisational Performance
- H 8 Process Management Capability is positively associated with the performance of the process for determining customer needs
- H 9 Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations
- H 10 Process Management Capability is positively associated with the performance of the process for designing new products and services
- H 11 Process Management Capability is positively associated with the performance of the process for providing products and services to customers
- H 12 Process Management Capability is positively associated with the performance of the process for billing customers
- H 13 Process Management Capability is positively associated with the performance of the process for providing after-sales services

1.4 Scope of the Research

The main emphasis of this thesis is to develop and operationalise the construct of Process Management Capability, to describe the mechanism that relates its variables (Process Alignment, People Involvement and Process Improvement Competency), and to examine the relationships between Process Management Capability, its variables and performance at the organisational and process levels. Data is drawn from Australia's Top 1000 companies based on market capitalisation.

This thesis delimits its investigation to the factors that internally influence performance, namely how well an organisation manages its business processes. It does not consider how the external environment influences the management of business processes (eg through the impact of competition, mergers or acquisitions, exchange rates, and political and legal requirements). It takes no account of the strategy of an organisation and how successful it might be. This thesis also delimits its investigation to the Top 1000 largest companies in Australia by market capitalisation.

1.5 Significance of the Study

This thesis is designed to develop and test a model to examine the relationship between Process Management Capability and business performance. From an established theoretical perspective, hypotheses are proposed and then empirically tested, that relate Process Management Capability (comprising Process Alignment, People Involvement, and Process Improvement Competency) to business performance.

This thesis is significant to both academic and practising managers. To academicians, this research provides empirical evidence as to the effect of Process Management Capability on business performance. It also contributes to the current state of knowledge on the practice of Business Process Management particularly in Australia. Specific contributions of this thesis to academicians are: (1) development of the theory surrounding Business Process Management (namely, Process Alignment, People Involvement, and Process Improvement Competency); (2) definition and operationalisation of the construct Process Management Capability that captures how well an organisation practices Business Process Management; (3) better insight into the mechanism relating Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance; (4) the practice of Business Process Management in an Australian context.

Organisations are constantly seeking better ways to improve their competitive advantage and profitability. Decisions that have to be made by practising managers include the choice of management style (command and control versus level of empowerment), purchase of new technologies, and what projects are needed to improve operations. This thesis benefits practising managers by showing how these decisions are related to process management. The findings of this thesis will provide guidance for practising managers seeking to understand the concept of core processes and their management.

1.6 Organisation of the Thesis

This thesis is organised into eight chapters as follows: Introduction; Literature Review; Research Model and Research hypotheses; Empirical Research Design, Preliminary Data Analysis, Data Analysis and Results, Findings and Discussion, and Conclusion.

Chapter 1 of this thesis provides a general introduction to the nature and intent of the research. The purpose, scope and significance of the research are presented.

Chapter 2 reviews previous studies that define the field of Business Process Management. Then, the chapter briefly describes literature that addresses organisation structure, strategic management, information technology, process improvement, and performance measurement system. The relationship of these areas to the research is highlighted.

Chapter 3 develops a research model connecting Process Management Capability and business performance, defines the construct and variables in the model and operationalises them. The research hypotheses are then put forward.

Chapter 4 discusses the empirical survey design that includes: research design, survey design issues, instrument development and operationalisation, and survey instrument pilot testing. It then discusses survey administration and data collection. Statistical methods for data analysis are briefly discussed at the end of the chapter.

Chapter 5 deals with the preliminary data analysis. This chapter describes the statistical procedures used to analyse the collected data. The chapter begins with the response profile and compares it with previous surveys in Business Process Management. This is followed by analysis of non-response bias. The profile of responding organisations and profile of respondents is then presented. It is followed by the profile of process improvement programs. Assessment of the validity and reliability of the measurement instrument are rigorously tested. Descriptive statistics are presented on the responses of Australia's Top 1000 companies.

Chapter 6 deals with data analysis for the research hypotheses. First, the data are explored to check the assumptions required for parametric data analysis. Second, Correlation Analysis is used to examine the relationship between the components of Process Alignment and Organisational Performance; the components of People Involvement and Organisational Performance; and the components of Process Improvement Competency and Organisational Performance. Third, Elaboration Analysis, which provides insights into the results of Correlation Analysis and Partial Correlation Analysis, is used to identify the mechanism of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance. Fourth, Correlation Analysis is used to examine the association of Process Alignment, People Involvement, Process Improvement Competency and Process Management Capability on Organisational Performance. Fifth, Multiple Linear Regression is used to examine the interaction effect of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance. Sixth, Correlation Analysis is used to analyse the association between Process Management Capability and Core Process Performance.

Chapter 7 addresses the findings and discussion of this research. Each of the thirteen hypotheses is interpreted in terms of insights into Business Process Management.

Chapter 8 describes the conclusions of this research. It first summarises the findings of this research, then the limitations of the research and other contribution of the research. Finally, the implications for future research are discussed.

CHAPTER 2

THEORETICAL FOUNDATION

This chapter reviews the literature relevant to the thesis. First, the literature concerning Business Process Management is examined. Then, a review of literature on Organisational Structure is described. This is followed by brief literature review on Strategic Management and Information Technology. Finally, a literature review on Process Improvement is examined.

2.1 Business Process Management

Business Process Management (BPM) has become an important topic in the language of many organisations (Pritchard and Armistead, 1999). Researchers in Western countries, especially in the United Kingdom and United States, led most of the initial work in developing the concepts within Business Process Management and focused on identifying the operational and strategic importance of business processes. Armistead and Machin (1997), Elzinga et al. (1995), Hammer (1996) and Zairi (1996) were notable contributors.

The label Business Process Management as a field of study is still in its infancy. Yet the interest in Business Process Management has grown steadily over recent years. There has been a steady increase in the number of journals, discussion groups and web sites related to Business Process Management. For example the *Business Process Management Journal* from MCB University Press, *The Journal of Knowledge and Process Management* from Wiley & Sons, *The Business Process Resource Centre* from University of Warwick in the UK and the *Business Process Management Institute* in the US.

One of the difficulties in attempting to define the concepts within Business Process Management is that of terminology (Pritchard and Armistead, 1999). The term 'process' is found in many disciplines. An operational view is seen in quality management (Deming, 1986), total quality management (Oakland, 1989) and the concept of just-in-time (Harrison, 1992). Systems thinking (Jenkins, 1971; Checkland, 1981), cybernetics (Beer, 1966) and systems dynamics (Senge, 1990) give a richer meaning to the term 'process'. Organisational theorists have also talked in terms of social and organisational processes (Burrell and Morgan, 1979; Monge, 1990). Porter's value chain (1985) emphasises the competitive advantage of unique processes.

The next section provides current definitions of Business Process Management and its characteristics. This is followed by the reasons why organizations adopt BPM and the benefits of BPM. Finally, the concept 'business process' is discussed.

2.1.1 Definition and Principles of Business Process Management

The following definitions of Business Process Management have been offered:

> "an approach which is dependent on strategic elements, operational elements, use of modern tools and techniques, people involvement and, more importantly, on a horizontal focus which will best suit and deliver customer requirements in an optimum and satisfactory way" (Zairi, 1997, p 78).
>
> "a systematic, structured approach to analyze, improve, control, and manage processes with the aim of improving the quality of products and services (Elzinga et al., 1995, p 119).
>
> "a customer-focused approach to the systematic management, measurement and improvement of all company processes through cross-functional team work and employee empowerment" (Lee and Dale, 1998, p 217).
>
> "a strategy of achieving sustainable competitive advantage through continually developing outstanding business processes" (The Economist Intelligence Unit Limited and Andersen Consulting, 1996, p 2).
>
> "a revolutionary process that challenges managers to rethink their traditional methods of doing work. It refocuses the business on its customers and involves the reshaping of management style and culture, and possibly organisation structure, combined with considerable delegation of authority and an emphasis on the continuous development of staff" (Moreton and Chester, 1997, p 8).
>
> "a customer oriented management endeavour to achieve exceptional performance in those business processes which transcend functional boundaries""'(Hinterhuber, 1995, p 65).
>
> "a management philosophy that emphasises the importance of aligning a company to its market value chain. Its key purposes are to link a company's operations more directly with its strategy. ..... In this context, business processes become the primary channels for receiving and delivering value. They need to be managed holistically as processes, rather than through the co-ordination of separate activities which take place in disconnected functions" (Boardman, 1997, p 248).
>
> "coordination of the design and management of workflows (the industrial engineering tradition); investing in organizational resources such as people, structure, and strategy, and the costs of meeting target standards for quality and service" (Keen and Knapp, 1996, p 22).

According to Lee and Dale (1998), there are four main strands running through definitions of Business Process Management. These are structured, analytical, cross-functional, and continuous improvement of processes. Zairi (1997, p 65) stated that "BPM is concerned with the main aspects of business operations where there is high leverage and a big proportion of added value". He mentioned that Business Process Management has to be governed by seven rules (Zairi, 1997, p 65): "(1) Major activities have to be properly mapped and documented; (2) BPM creates a focus on customers through horizontal linkages between key activities; (3) BPM relies on systems and documented procedures to ensure discipline, consistency and repeatability of quality performance; (4) BPM relies on measurement activity to assess the performance of each individual process, set targets and deliver output levels which can meet corporate objectives; (5) BPM has to be based on a continuous approach of optimisation through problem solving and reaping extra benefits; (6) BPM has to be inspired by best practice to ensure that superior competitiveness is achieved; (7) BPM is an approach for culture change and does not result simply through having good systems and the right structure in place."

The defining principles of Business Process Management are described in more detail in the following.

1) Holistic view

BPM takes a holistic view of the network of parallel and serial processes that represent the work an organization does. A holistic view attempts to overcome the piecemeal improvements in isolated parts of a business process which often result in sub-optimal solutions (Kutschker, 1994). Business Process Management acknowledges the interdependence of all processes, focusing on optimisation of overall performance. It addresses the interdependence of strategy, people, processes and technology in achieving business objectives. The integration of these four components is necessary to move towards process excellence (The Economist Intelligence Unit Limited and Andersen Consulting, 1996). Much of the literature on managing processes is concerned with process improvement (Melan, 1989; Tucker, 1996) and this is typically directed at how to improve operational tasks within processes. However, Armistead (1996) noted that the real value derived from the process approach is through the understanding and development of an approach at higher levels within the organisation, rather than simply process improvement activities at the task level aimed reducing waste, rework and error.

2) Strategic imperative

According to Keen and Knapp (1996), BPM is a major source of competitive positioning and differentiation. The achievement of a BPM approach depends on aligning the results of processes with corporate goals and having every employee's efforts focused on adding value to the end customer. Many authors, including Olian and Rynes (1991) and Zairi (1997), acknowledge this view. Processes and strategy must be aligned if strategy is to be effective. The nature of strategy and its management particularly relates to the setting of an organisation's long term objectives (Ansoff, 1984). Strategic direction and goal setting should be communicated consistently down through the organisation and should define process-specific goals and the strategic direction for process teams (Caudle, 1994). Tactics to support strategies should be devised as the process unfurls (Kirkham, 1996). Davenport (1994) stated that acknowledging the impact of strategic issues on process management early in strategic planning would make operational decisions easier and more consistent.

3) Enabled by information technology

Information technology is a powerful enabler for managing business processes and is transforming business (Gates and Hemingway, 1999; The Economist Intelligence Unit Limited and Andersen Consulting, 1996). Once data is captured, technology moves it quickly across the corporation, improving the speed of decision-making (Jacob, 1995). New technologies consistently alter the way work is performed and increase the capacity to monitor and co-ordinate work. This substantially enhances the ability of organisations to enlarge unit sizes, reduce direct supervision, and promote cross-functional, cross-organisational communication and interfaces (Hyde, 1997). Recently, Enterprise Resource Planning products such as SAP and PeopleSoft have been installed in large companies to provide integrated performance management systems. Enterprise Resource Planning products are designed to give employees the information necessary for doing their job and produce data for process improvement (Jenson and Johnson, 1999; Martin, 1998).

4) Corporate-wide impact

The Economist Intelligence Unit and Andersen Consulting (1996) stated that companies that excel at their managing business processes are making Business Process Management one of their core values. BPM affects every aspect of an organisation, from its structure (organised around processes) to its management (process leaders versus functional heads). Involvement of all staff in co-operative efforts must be promoted if organisations are to excel in process management (Oakland and Sohal, 1996; Waldman, 1994). According to Harrington (1995), Business Process Management is fundamentally a senior management responsibility. They determine the vision for the organisation, determine its strategic priorities, guide the design of processes, break down walls and barriers to effective performance and establish the key enabling factors for all employees to make optimum contributions. These factors include reward and recognition systems, resource allocation, training and culture. When an organisation adopts BPM it should be prepared to acknowledge that its impact would be corporate-wide.

5) Emphasises cross-functional process management

Business process management attempts to overcome problems raised by the Tayloristic view of structural specialisation (Kutschker, 1994). However, changing processes without altering the firm's basic managerial design, will have short-lived benefits (The Economist Intelligence Unit and Andersen Consulting, 1996). This includes changing the design of its organisational structure. According to Kirkham (1996), the key element of process orientation is the flattening of the hierarchy.

Keen (1997) mentions that most organisational processes are cross-functional and cut across traditional functional boundaries. The functional approach may create barriers to achieving customer satisfaction (Edson and Shannahan, 1991). The process-based approach attempts to improve customer focus by avoiding the limitations of managing by vertical functions (Clemmer, 1996; McAdam, 1996). 'Best in class' organisations have recognised the need to move away from the traditional functionally based approach to managing through a set of customer driven processes (Zairi, 1997).

2.1.2 Reasons Why Organisations Adopt Business Process Management

Since the mid-80's, organisations have been forced to rethink the way they do business due to fundamental changes in customer requirements, competitive pressures and the quality movement (Kaplan and Murdock, 1991). In the US, many organisations are engaged in continually assessing ways in which their productivity, product quality, and operations can be improved (Elzinga et al., 1995). In the 1990's, many companies have undertaken radical redesign of business processes to achieve dramatic improvement in organisational performance. This movement was known as Process Reengineering (CSC Index, 1994; Lawler et al., 1998). However, many scholars reported a fifty to seventy percent failure rate of process reengineering projects (CSC Index, 1994; Hammer and Champy, 1993; Murphy, 1994; Stewart, 1993).

BPM evolved following failures in Process Reengineering. According to Hammer (1996), who popularised reengineering, organisations must place the emphasis on "processes" rather than on "radical change". Managers had to learn first how to practice process management before they attempted radical change. Bartlett and Ghoshal (1990), Drucker (1992) and Hammer (1996) all highlighted the emphasis on better managing business processes.

Garvin (1995) stated that the reasons why organisations adopt a process management approach are:

- It allows increasing flexibility to meet changing external demands
- It addresses the speed to market of new products and services and responsiveness to the demands of customers

- It facilitates increased reliability in product delivery
- It helps address the quality of products and services in terms of their consistency and capability to meet customer requirements

Several business practitioners and management scholars have advocated that Business Process Management has a significant impact upon the success of organisations (Elizinga et al., 1995; The Economist Intelligence Unit and Andersen Consulting, 1996; Zairi, 1997). Chung (1994) stated that the key to success in the 21st century is to have efficient processes to deliver value to customers. There is a need to work smarter, better and faster in a rapidly changing market place. There is a need to improve responsiveness and quality to overcome competitive threats (Pritchard and Armistead, 1999).

2.1.3 Benefits of Business Process Management

Keen and Knapp (1996) argue that a focus on business process is a major source of sustainable competitive positioning and differentiation. Organisations adopting a business process view seek improvements in cross-functional process management by getting managers to think more along process lines than functional lines. Perceiving an organisation as a series of processes rather than as a functional reporting structure is particularly useful because it allows organisations to optimise the strategic capabilities inherent in their processes. BPM translates vertical boundaries into horizontally defined formations to connect the entire organisation (Spector, 1995).

Business Process Management benefits the organisation in many ways. Ostroff (1999) pointed out that Business Process Management may:

First, flatten the pyramid (hierarchy) by reducing non-value added work through empowering team members (who are not necessarily senior managers) with the authority to make decisions directly related to their activities within the value chain. Second, strengthen relationships with suppliers. Third, dramatically upgrade skills and education by empowering people by giving them the tools, skills, motivation and authority to make decisions essential to the team's performance. Business Process Management also promotes multi-skilling, the ability to think creatively and respond flexibly to new challenges that arise in the work that teams do. Fourth, Business Process Management may help to build a corporate culture of openness, cooperation and collaboration. This is a culture that focuses on continuous performance improvement and values employee empowerment, responsibility and well-being via installation of process owners or managers who will take responsibility for the core processes in their entirety, and make teams, not individuals, the cornerstone of organisational design and performance.

DeToro and McCabe (1997) stressed that Business Process Management solves many of the sub-optimisation problems prevalent in traditional vertical structures. According to Feigenbaum (1982), the term sub-optimisation refers to management decisions and behaviour which tends to focus on the performance of one functional unit, often at the expense of another. These decisions may optimise the use of resources within one function but may be detrimental to the operation of the entire firm.

Business Process Management may also benefit an organisation by (DeToro and McCabe, 1997): (1) Focusing on the customer: While vertical organisations tend to associate performance with only financial results, horizontal performance measures emphasise customer satisfaction. Through its horizontal approach, BPM allows organisations to concentrate on quality and serving customers. This has the potential to provide a unifying focus on customers that might not otherwise exist. It enables employees to become more productive by gaining knowledge of customer needs through their involvement in customer-facing processes. (2) Managing hand-offs between functions: BPM minimises or eliminates the functional barriers and consequently reduces delays, multiplicity of steps and communication problems. It also minimises arguments among managers who are more accustomed to confrontation than cooperation. (3) Avoiding turf mentality: BPM eliminates the risk of a turf mentality developing as employees have a stake in the final cross-functional result instead of just what happens in their department.

BPM should lead to improved customer satisfaction and building sustainable competitive advantage so that an organisation can excel in the long term. The business process view enables companies to establish performance objectives for their processes and measure against them. These are in addition to customer satisfaction, employee satisfaction and traditional financial measures (Ostroff, 1999).

2.1.4 Concept and Classifications of Business Process

The usage of the term 'business process' has grown in everyday business language. Identification and effective management of business processes are key to the success of BPM (Zairi, 1997). DeToro and McCabe (1997) suggest that by using BPM, the work organisations do may be viewed as a series of business processes linked across the organisation. Policy and direction are still set from the top, but the authority to examine, challenge and change work methods is delegated to cross-functional work teams.

Many of today's business processes are complex, consisting of many contact points with the customer in service and product chains and crossing several functional entities of the organisation. Many definitions of business process have been offered. Some definitions are described in this section, which is followed by a classification of business processes.

The following definitions of business process have been offered:

> "a set of logically related and continuously evolving activities combined to satisfy a business objective" (The Economist Intelligence Unit and Andersen Consulting, 1996, p 2).
>
> "a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer" (Hammer and Champy, 1993, p 33).
>
> "a group of logically related tasks that use the resources of an organization to provide defined results in support of the organization's objectives" (Harrington, 1991, p 9)
>
> "a set of logically related tasks performed to achieve a defined business outcome" (Davenport and Short, 1990, p 12).
>
> "a series of steps designed to produce a product or service. Some processes may be contained wholly within a function. However, most processes are cross-functional, spanning the 'white space' between the boxes on the organization chart" (Rummler and Brache, 1990, p 45).

> "a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization, in contrast to a product focus's emphasis on what. A process is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action" (Davenport, 1993b, p 5).

Most of these definitions follow similar lines, emphasising the nature of a structured set of activities designed to produce an intended output and the creation of value for the customer (Melan, 1985a). A business process perspective identifies the scope and internal logic of work needed to achieve customer satisfaction. It begins by identifying the customer (internal and external), suppliers, conditions of satisfaction, roles and responsibilities (of process owners and managers) and the total workflow (from the customer's request until the achieved customer satisfaction) (Schal, 1996).

Davenport and Short (1990) and Hammer and Champy (1993) argued that there are two important characteristics of business processes that should be emphasised. First, business processes should not only focus on organisational targets, but more importantly on value-creation for the customer (Hickman, 1993). Second, the cross-functional and cross-organisational nature of processes should be recognised. This is the concept of the 'extended process' (Yingling, 1997).

The International Benchmarking Clearinghouse (1995) provided a nomenclature for the business processes often found in many industries. They named seventy-one key processes and one hundred and eighty-seven sub-processes. The seventy-one key processes were categorised into thirteen groups. These groups are: understand markets and customers; develop vision and strategy; design products and services; market and sell; produce and deliver for manufacturing; produce and deliver for service oriented organisation; invoice and service customers; develop and manage human resources; manage information resources; manage financial and physical resources; execute environmental management program; manage external relationships, and manage improvement and change.

In the following, six classifications of business processes are described. Then, summary of the relationship among these classifications is illustrated in Table 2.1.

Earl and Khan (1994) proposed an early framework for process classification. Their framework consists of four phases: core processes, support processes, management processes and business network processes. They stated that (1) core processes are those central to business functioning and relate directly to external customers. (2) Support processes have internal customers and provide the infrastructure for core processes. (3) Management processes are those by which firm's plan, organise and control resources. (4) Business network processes are those which extend beyond the boundaries of the organisation into suppliers, customers and strategic partners.

The CIM-OSA Standards Committee (CIM-OSA, 1989) established a structure that subdivides processes into three main types: operate, support, and manage. The CIM-OSA structure regards (1) Operate processes are viewed as those which are directly related to satisfying the requirements of the external customer, for example the logistics supply chain from order to delivery. (2) Support processes typically act in support of manage and operate processes. They include financial, personnel, facilities management, and information systems provision. (3) Manage processes are those which are concerned with strategy and direction-setting as well as with business planning and control. Direction-setting processes include all high level strategic planning activities. They manage activities that take ideas about direction based upon business and environmental information, including customer feedback, and transform these into a set of strategies, operational goals and performance measures (Childe et al., 1994).

Hunt (1996) classified three types of business processes: customer processes, administrative processes and management processes. He states that: (1) Customer processes are those processes resulting in a product or service that is received by an organisation's external customer. (2) Administrative processes are those processes that produce products or services that are invisible to the external customer but essential to the effective management of the business. (3) Management processes are those processes that include actions managers should take to support all business processes. Management processes include goal setting, day-to-day planning, performance feedback, rewards, and resource allocation.

Armistead and Machin (1997) categorised processes into operational, support, direction setting and managerial processes. The first two types are similar to CIM-OSA (1989), except that Armistead and Machin split the 'manage process' area into direction setting and managerial process. They claim: (1) direction setting processes are concerned with setting strategy for the organisation, its markets and the location of resources as well as managing change within the organisation. Direction setting processes involve a mix of formal planning processes and less well-defined frameworks. (2) Managerial processes are to some extent superordinate to the other categories and contain decision making and communication activities. For example, the entrepreneurial process, competence building process and renewal processes proposed by Ghoshal and Bartlett (1995) are managerial processes.

According to Armistead and Machin (1997), the separation of direction setting and managerial processes is driven by two considerations. First, on a practical level, models such as the European Foundation for Quality Management (EFQM) separate policy (a managerial process) and strategy formulation (a direction setting process). The EFQM model is similar to the Malcolm Baldrige National Quality Award (MBNQA) in the US and the Australian Quality Award (AQA) in the Australia. Many organisations adopt these models for organisational self-assessment. Second, the strategy literature regards development of strategy as a process in its own right.

Garvin (1998) presented a unifying framework for thinking about processes. This framework includes two groups of processes: organisational processes and managerial processes. As Garvin suggested, (1) organisational processes encourage an organisational perspective that enables managers to mesh segmented tasks with the larger needs of the organisation. He suggests that rather than focusing on individuals or departments when problems arise, managers need to be more attentive to organization-wide processes; furthermore, he argues that design efforts should begin by attending to these processes and only later shift to the structures needed to accommodate them. Organisational processes can be further decomposed into three types: work processes, behaviour processes, and change processes. (2) Managerial processes include direction setting, establishing goals, negotiation and selling, obtaining needed support and resources, monitoring and control, and tracking activities and performance. Garvin claimed that managerial processes depend on rich communication, sensitivity to relationships, and an understanding of the organisation's power relationships.

Porter (1985) established a Value Chain Model, which is a guiding framework to assess competitive position in terms of the activities an organization performs. Primary and support activities describe how the product or service is provided to the customer. Primary activities are those involved in the physical movement of raw materials and finished products; in the production, marketing and servicing of the outputs. Support activities support the primary activities and each other. Support activities pervade the whole organisation and provide the infrastructure for successful product and service provision.

A summary of above classifications of business processes is illustrated in Table 2.1.

<table>
<tr><th>CIM-OSA Standards Committee (1989)</th><th>Earl and Khan (1994)</th><th>Hunt (1996)</th><th>Armistead and Machin (1997)</th><th>Garvin (1998)</th><th>Porter (1985)</th></tr>
<tr><td>Operate processes</td><td>Core processes</td><td>Customer processes</td><td>Operational processes</td><td rowspan="2">Organisational Processes</td><td>Primary activities</td></tr>
<tr><td>Support processes</td><td>Support processes</td><td>Administrative processes</td><td>Support processes</td><td>Support activities</td></tr>
<tr><td rowspan="2">Manage Processes</td><td rowspan="2">Management Processes</td><td rowspan="2">Management processes</td><td>Direction setting processes</td><td rowspan="2">Managerial processes</td><td rowspan="2"></td></tr>
<tr><td>Managerial processes</td></tr>
<tr><td></td><td>Business network processes</td><td></td><td></td><td></td><td></td></tr>
</table>

Table 2.1 Classification of business processes according to different scholars

This thesis classifies business processes into three categories - core processes, support process, and managerial processes. It uses the following definitions. Core processes are processes that cross-functional boundaries, produce an output that is strategically important to the organisation's success, and have a high impact on customer satisfaction. They face customers directly. Example of core processes include order fulfillment, product development, and customer service. Support processes have internal customers and provide the infrastructure for core processes. Examples of support processes include legal services, human resources services, financial services, administration services, management systems, and information services. Managerial processes are those by which organisations plan, organise and control resources. Examples include policy deployment, budgeting and performance reviews.

2.2 Organisational Structure

Business Process Management challenges traditional ways of structuring organisations (Elzinga et al., 1995). The structure is reflected in the organisational chart. According to Daft (1995), organisational structure must accomplish two things for the organisation. It must provide a framework of responsibilities, reporting relationships, and groupings, and it must provide a template for linking and coordinating organisational elements into a coherent whole.

In this section, several traditional types of organisational structure are discussed. These are functional, divisional, hybrid, and matrix structures. This is followed by the advantages and disadvantages of each type. The concept of the horizontal organization is then discussed.

2.2.1 Types of Traditional Organisational Structures

Organisational structure provides a template for vertical and horizontal linkages across the organisation (Daft, 1995). Early organisation theorists stressed the vertical design of organisational charts and relied on vertical structures. Today, the trend is toward flatter, more horizontal structures.

In the vertical structure, the organisation is viewed as a collection of activities which divide work into functions, departments, and then tasks (Chung, 1994; Ostroff and Smith, 1992). Work is grouped by functional expertise according to either skills, specialty or work activities (Ostroff and Smith, 1992). In a horizontal structure, organisations are viewed as a collection of business processes. The organisation is structured around processes and there are no longer traditional departments or functions (Byrne, 1993; Gadd and Oakland, 1996; Stewart, 1992). Core processes are managed through teams. Pure horizontal structures are relatively new.

According to Huse (1980), traditional organisational structures can be classified into functional, divisional, hybrid, and matrix. The earliest forms of organisations tended to structure themselves either functionally into task-specialised departments or divisionally into specific products or regions. The hybrid and matrix structures were more recent innovations. A hybrid structure is a design that combines characteristics of product, function and geography (Vecchio et al., 1996). A matrix structure emphasises functional specification and horizontal linkages in which both horizontal and vertical designs are implemented simultaneously (Daft, 1995).

In the following, each organisational structure is described in more detail based on Huse's (1980) classification.

Functional Structure

A functional structure is an organisational design that groups personnel along functional lines. Activities and resources that are essential to the production process are managed by functional units. The functional design fragments end-to-end work, has extensive command and control mechanisms, and relies on specialisation (Huse, 1980; Varney, 1976; Vecchio et al., 1996). Typical names for functional units include Sales, Purchasing, Production, Warehouse and Distribution.

Duncan (1979) and Daft (1995) pointed out that the functional structure is appropriate when the most important needs of an organisation are collaboration and expertise, when the environment is stable, and when only one or a few products are produced. Within a functional structure, employees are committed to achieve the goals of their respective functional departments. Planning and budgeting is by function and reflects the cost of resources used in each function. Formal authority and influence within the organisation rests with upper managers in the functional departments (Cushway, 1993; Huse, 1980).

Divisional Structure

The divisional structure is used when an organisation chooses to offer different kinds of products or services. It is primarily a way of organising the activities of top managers around product and service bundles (Huse, 1980; Varney, 1976). This type of structure allows each product or service to be set up and managed independently from others, usually as a separate business with their own financial statements (Sloan, 1964). Using this structure, the organization can be structured according to individual products, services, groups, divisions, businesses, or profit centres.

Divisional structures typify structures designed around divisions. The critical task of a divisional structure is to coordinate and control diverse markets and products. Division heads are responsible for all human and capital resources required to produce and market a product. Decision-making is enhanced by putting all product decisions in one location, and as decision-making is pushed down, decisions that affect product quality can be made more quickly without input from head office.

Hybrid Structure

A hybrid structure is a structure in which organisations combine the characteristics of both functional and divisional structures (Daft, 1995; Lansbury, 1983). As a corporation grows large and has several markets, it is typically organised into product and service groups at the divisional level. Functions that are important to each market are decentralised to each division. However, some functions which may be highly specialised are also centralised and located at headquarters. These functions may be relatively stable, provide corporate-wide services, and require economies of scale and in-depth specialisation. Examples include finance, organisational development and corporate planning.

In a hybrid structure, work teams are encouraged to promote lateral relations across the functions within divisions. This allows problems to be solved for which no one particular function has responsibility or expertise (Cushway, 1993; Huse, 1980).

Matrix Structure

According to Emery and Thorsrud (1969), a matrix structure functions as a web of relationships rather than a direct line and staff relationship. The web of relationships is aimed at starting and completing specific projects. Larson and Gobeli (1987) stated that a matrix structure is a mixed organisational form in which normal hierarchy is overlayed by some form of lateral authority, influence or communication.

The matrix structures, rather than dividing the organisation into separate parts as in the hybrid structure, has functional and team leaders with equal authority. Personnel are required to report to both functional managers and team leaders who manage product and service delivery. In essence, a matrix structure involves a dual hierarchy.

Researchers have suggested that matrix structures are responsive to three major conditions: pressures for shared resources, environmental pressures for dual focus, and pressures for high information-processing capacity (Davis and Lawrence, 1977).

1) Pressures for shared resources

Conventional functional organisations tend to resist the sharing of resources and the development of teams across organisational lines. Today, however, organisations limit their human resources, particularly when expensive and highly specialised talents are required. The move to specialist outsourcing is evidence of this. Thus, there are strong internal pressures to share existing human resources particularly when the environment is quickly changing. The same pressure builds for the sharing of expensive physical facilities, capital equipment and similar resources.

2) Environmental pressures for dual focus

Pressure exists on organisations to provide technical expertise and frequent new products and services. This dual pressure means a balance of power is needed between the functional and product dimensions of an organisation. Proponents of matrix structures argue that a dual authority structure is needed to maintain that balance. Recent research suggests that the success of a matrix structure depends on an appropriate separation of roles and responsibilities between the project managers for new products and services and the functional managers (Katz and Allen, 1985; Larson and Gobeli, 1987). Project managers should be given greater organisational influence and should focus outwards in order to gain critical resources and cooperation. Functional managers should focus inwards on the technical excellence and integrity of the project (Cummings and Worley, 1997).

3) Pressures for high information-processing capacity

The environmental domain of the organisation is both complex and uncertain. Frequent external changes and high interdependence between departments require a large amount of coordination and an enriched information processing capacity in both vertical and horizontal directions. The matrix structure develops people who can think and act in a general management mode, thus increasing an organisation's information processing capacity (Galbraith, 1977).

Proponents of matrix structures argue that the vertical and horizontal lines of authority must be given equal recognition. A dual authority structure should be created so that the power between vertical and horizontal lines of authority is in balance.

2.2.2 Advantages and Disadvantages of Each Type of Organisational Structure

Functional Structure

The main advantage of the functional structure is that it promotes specialisation of skills and resources. People are grouped together who perform similar work and face similar problems. This facilitates communication within departments and allows specialists to share their expertise within their department. This increases the knowledge of their departmental colleagues and also enhances career development within the specialty. For example people may seek careers within finance, engineering or sales (Cummings and Worley, 1997).

The functional structure suffers from several disadvantages (Huse, 1980). The main disadvantage is a slow response to environmental changes that require coordination across departments. Other disadvantages of the functional structure are that innovation is slow because of poor communication and barriers, and each employee has a restricted view of, and hence narrow allegiance to, the organisation's goals.

Divisional Structure

There are two advantages associated with divisional structures (Huse, 1980; Daft, 1995). First, the divisional structure encourages efficient allocation of capital. Headquarters can choose where to invest its money, and so it can concentrate on the strongest markets. Second, the divisional structure spreads risk. "... if there is a breakdown in one portion of a loosely coupled system then this breakdown is sealed off and does not affect other portions of the organization" (Weick, 1976, p 7).

There are two disadvantages of a divisional structure (Daft, 1995; Duncan, 1979; Huse, 1980). The first disadvantage is that a divisional structure may lead to a loss of economies of scale. For example, instead of fifty research engineers sharing a common facility in a functional structure, ten engineers may be assigned to each of five product divisions. The critical mass required for in-depth research may be lost, and physical facilities have to be duplicated for the five product divisions. The second disadvantage is redundancy of effort and little cooperation across product lines. The product lines become separated from each other, and coordination across product lines can be difficult. Sharing of competencies and technical advances are also limited.

Hybrid Structure

A major advantage of the hybrid structure is that it enables the organisation to pursue adaptability and effectiveness within product divisions while simultaneously creating efficiencies in functional departments (Cushway, 1993; Huse, 1980). The hybrid structure also provides alignment between product divisions and corporate goals. The product divisions also create effective coordination within divisions, while the corporate functional departments provide coordination across divisions.

One disadvantage of the hybrid structure is administrative overhead (Daft, 1995). Organisations can experience a build-up of corporate staff to oversee divisions. Some corporate functions may duplicate activities undertaken within product divisions. If uncontrolled, administrative overheads can increase, as headquarters staffs grow in number. Decisions then become more centralised, and the product divisions lose the ability to respond quickly to market changes. Associated with this is the conflict between corporate and divisional personnel (Cushway, 1993; Lansbury, 1983). Headquarters functions typically do not have line authority over divisional activities. Division managers may resent headquarters' instructions, and headquarters' managers may resent the desire of divisions to go their own way. Headquarters' executives may not understand the unique needs of the individual divisions that are trying to satisfy different markets.

Matrix Structure

A major advantage of the matrix structure is that it allows multiple orientations (Daft, 1995). Through its vertical dimension, specialised, functional knowledge can be applied to all projects. Through its horizontal dimension, resources can be flexibly allocated across different products, and the organisation can adapt to changing external requirements (Burns and Wholey, 1993). The matrix structure also provides an opportunity for employees to acquire either specialised functional or general management skills, depending on their interests.

One disadvantage of the matrix structure is that it can be difficult to manage. To implement and maintain matrix structures requires heavy managerial costs and support. In addition, the matrix structure can create significant frustration and confusion, especially for employees who report to two bosses. Such employees need excellent interpersonal and conflict-resolution skills, which may require special training in human relations. The management of a matrix structure is also very time consuming. It forces managers to spend a great deal of time in meetings and conflict resolution sessions (Bartlett and Ghoshal, 1990). Performance evaluation may also become complicated because of the dual authority system in place, especially, if people do not cooperate in resolving conflicts over the sharing of power and resources (Katz and Allen, 1985; Larson and Gobeli, 1987).

2.2.3 Horizontal Organisation

In recent years, the traditional designs of organisational structures have been challenged. Some scholars have argued that organisations should move away from any form of a vertical structure to a pure horizontal structure (Boehm and Phipps, 1996; Ostroff, 1999; Spector, 1995). Many companies have started to move from a relatively functional and hierarchical structure to one with a focus on cross-functional teams and lower organisational walls (Hyde, 1997; Ostroff & Smith, 1996).

The move from vertical to horizontal structures is called 'going horizontal' (Jacob, 1995). According to Rowland and Armistead (1996), going horizontal requires major changes in management style, reporting relationships and support systems.

Horizontal organisations have the following characteristics:

1. Structure is created around core processes rather than departmental functions. Boundaries between traditional department are obliterated (Byrne, 1993; Stewart, 1992). The responsibility for each core process is taken by process owners (Byrne, 1993; Ostroff, 1999; Stewart, 1992). The role of process owners is described in more detail in section 2.2.4.2.

2. The vertical hierarchy is flattened. There tends to be fewer senior executives and fewer staff in traditional support functions, such as finance and human resources.

The decrease of vertical hierarchy is achieved by eliminating non-value-added work and giving team members the authority to make decisions directly related to their activities within the core processes (Byrne, 1993; Stewart, 1992).

3. Management tasks are delegated to the lowest level. Most employees work in multidisciplinary, self-managed teams organised around core processes (Byrne, 1993).

4. Teams, not individuals, are the work units of a horizontal organisation. In horizontal organisations, work and the management of work are performed more by teams than by individuals (Hammer and Champy, 1993; Harrington, 1991). A team comprises people with complementary skills, committed to a common purpose, and has specific and measurable performance goals for which they hold themselves mutually accountable (Hickman, 1993). The team is not established within the confines of departments but around core processes (Jacob, 1995). Teams outperform individuals because they can direct a larger set of skills and experiences towards any problem-solving challenge (Ostroff, 1999).

5. Customers drive the performance of the horizontal organisation. For the horizontal design to work, processes must be based on meeting customer needs. Employees are brought into direct, regular contact with customers as well as suppliers. The horizontal organisation emphasises customer satisfaction (Jacob, 1995). The process perspective of a horizontal organisation requires it to start with customers and determine what they want, and then work backwards from there (Hammer, 1996).

2.2.3.1 Benefits of the Horizontal Organisation

The principal benefit of horizontal management is that it facilitates the smooth transition of products and services through different functions to the customer. This is achieved by empowering employees, improving communication, and eliminating unnecessary work (Chung, 1994; Clemmer, 1996). A horizontal management style increases the interaction of employees from the different departments and fosters close working relationships and better communication (Ostroff, 1999; Spector, 1999).

Employees from the different functions can obtain a better understanding of each other's responsibilities, thus reducing costly conflicts arising as a result of misunderstanding and disagreement among different departments (Spector, 1995; Chung, 1994). Other benefits of the horizontal organisation include encouraging individuals to share in decision-making, promoting team success over individual achievement, and a more responsive organisation (Hinterhuber, 1995; Klaus, 1989; Stewart, 1992). Managing horizontally can provide competitive advantage for the organisation (Hammer, 1995; White and Poynter, 1989).

2.2.3.2 Role of the Process Owner in a Horizontal Organisation

According to Harrington (1991, pp 45), a process owner is ".... the individual appointed by the management to be responsible for ensuring that the total process is both effective and efficient". Hammer and Stanton (1995, p 13) defined the process owner as "a senior individual designated by the leader to have end-to-end responsibility for the process and its performance".

Hammer (1996) pointed out that the appointment of process owners is critical to an organisation's success. The responsibility of the process owner is to manage and improve the core process across functional units, acting through his/her improvement teams. Many scholars describe the role of the process owner as making sure that processes are organised in efficient and productive ways (Arnstein and Dickerman, 1992; Curtice, 1995). The process owner must be able to anticipate business changes and their impact on the core processes. The owner must be at a high enough level to understand what new direction the business will be taking and how it will impact the process. Instead of direct supervision and control of team members, the role of the process owner is to be a coach and facilitate team cooperation and organisational communication (Curtice, 1995; Hammer and Stanton, 1995; Ready, 1995).

The owner is also responsible and accountable for training and developing team members in business process improvement skills and techniques (Harrington, 1991). Furthermore, the process owner needs to review progress, provide support to the team, and meet business and customer needs (DeToro and McCabe, 1997; Hammer, 1996).

Finally, in order to optimise the efficiency and effectiveness of the core process, the process owner must act to maximise performance of the entire organisation not just his/her core process. To optimise effectiveness of the core process, process owners must ensure external customers' requirements are met by the quality of output being provided by the core process (Kelbaugh, 1991).

2.3 Strategic Management

The increase in global competition, shortened product life cycles, accelerated technological advancements and enhanced customer requirements, have all caused fundamental changes in the ways in which companies compete. Companies no longer compete solely on the basis of price, and must formulate competitive strategies defined by market-driven requirements. Therefore, it has become increasingly important for firms to develop strategic objectives which facilitate the development of a competitive advantage in specific markets or market segments (Lockamy, 1997). Strategic objectives create initiatives designed to have a significant and favourable effect on the long-term health of the firm. The improvement of product, process and service quality has been adopted by many firms as a key strategic objective for achieving world-class performance levels (Thompson and Strickland, 1999).

Sustainable world-class performance will not occur if there is a misalignment between a firm's strategic objectives and actual market requirements. In addition, workflow coordination to support strategic initiatives is essential for ensuring the efficient use of company resources. In order for a firm to successfully compete through its strategic objectives, alignment must exist between the firm's strategies, actions and performance measures (Dixon et al., 1990). Not only are specific action programs required to support strategic objectives, but also integrated performance measurement systems are needed to facilitate consistent actions (Lockamy and Cox, 1994). Success in process improvement initiatives may not lead to better performance if the process to be improved does not aligned with company's strategy (Keen, 1997).

Most organisations attempt to develop, strategies and implement large-scale action plans to achieve long-term goals (Jauch and Glueck, 1988; Pearce and Robinson, 1988). Strategic management is the process of formulation and implementation of strategies to achieve strategic goals, given environmental and internal influences (Rue and Holland, 1989; Thompson and Strickland, 1999). Thus strategic management is oriented toward reaching long-term goals, weighs environmental elements, considers the organisation's internal characteristics and involves developing specific strategies. These strategies will alter the activities within one or more core processes.

Strategic management as a concept has evolved over time and will continue to evolve (Ginter and White, 1982). The current thoughts and practices that have contributed to the present understanding of strategic management are many and diffuse. Ideas that have emerged from business practice have been reviewed and synthesised by management scholars (Forster and Browne, 1996). The two major views that have developed in strategic management thought since the 1980s are the market-based view and the resource-based view (Schmidt and Treichler, 1998). In the market-based view, strategy is influenced mainly by the search for attractive markets. Market forces determine the resources and competencies which firms acquire. On the other hand, in the resource-based view, strategy is created around the innovative use of a company's competencies. In the resource-based view of strategic management, development of competencies is a prerequisite for an attractive market position.

2.3.1 Market-Based View

Michael Porter (1980) is one of the major contributors to the market-based view of strategic management in the 1980s. The publication of Porter's *Competitive Strategy* in 1980 marked a watershed in the development of strategic management thought (Forster and Browne, 1996). He claimed that there are two key issues regarding the choice of business strategy. One is the attractiveness of the industry in which the business is placed, assessed primarily by its long-term profitability prospects. The other is the set of factors, Porter's Five Forces, that determines the competitive position the business will adopt in order to gain a sustainable competitive advantage (Hax and Majluf, 1996).

2.3.1.1 Value Chain Model

Competitive position establishes the basis for achieving a sustainable advantage and is the relative standing a firm has against its most important competitors. Porter's Value Chain Model (1985) is a guiding framework to assess competitive position by examining a firm's activities. The value chain addresses a set of actions that are essentially controllable by the firm (Hax and Majluf, 1996).

According to Porter (1985), the value chain displays total value, and consists of value activities plus margins. Value activities are the physically and technologically distinct activities a firm performs. Margin is the difference between total value and the collective cost of performing the value activities.

The value activities of a firm can be divided into primary and support activities that make up the product or service provided to the customer (Porter, 1985). Porter's

Value Chain Model is depicted in Figure 2.1. The primary activities and support activities are discussed in section 2.1.4.1.

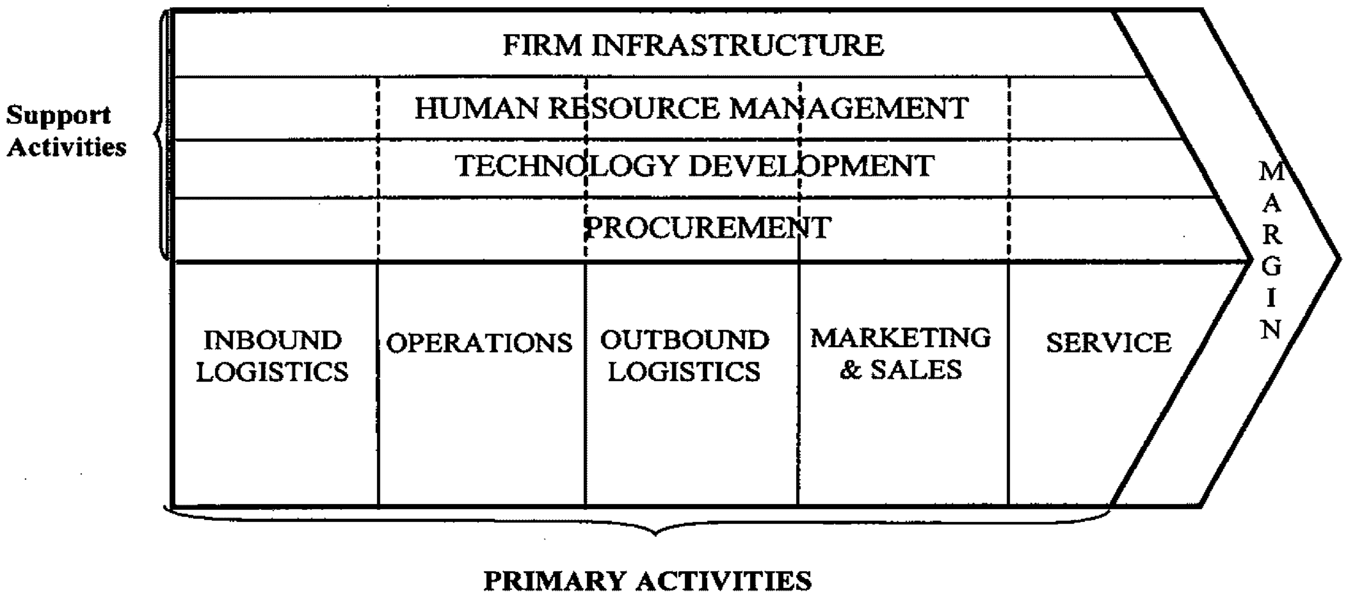


Figure 2.1 The generic Value Chain Model (Source: Porter, 1985)

Porter's value chain provides an effective way to diagnose the position of the business against its major competitors, and to define the foundation for actions aimed at sustaining a competitive advantage. According to Armistead and Clark (1993), Porter's value chain is designed to show where value is added and competitive advantage gained. Activities in the value chain correspond to core and support processes.

2.3.1.2 Generic Competitive Strategies

The basic concept of the value chain has been used by strategists to explain the success of various companies in pursuit of generic competitive strategies (Johnson, 1987; Johnson and Scholes, 1999).

Porter (1985) suggests that there are three basic generic strategies for achieving sustainable competitive advantage, namely differentiation, cost leadership, and focus. Generic competitive strategies are depicted in Figure 2.2.

		COMPETITIVE ADVANTAGE	
		Lower Cost	Differentiation
COMPETITIVE SCOPE	Broad Target	1. Cost Leadership	2. Differentiation
	Narrow Target	3A. Cost Focus	3B. Differentiation Focus

Figure 2.2 Three generic strategies (Source: Porter, 1985)

A cost leadership strategy involves achieving competitive advantage through lower cost than other firms in the market do. To pursue a cost leadership strategy means providing the product or service at the lowest cost. A differentiation strategy involves achieving competitive advantage through one or more product or service attributes that buyers perceive as important. The firm engaging in a differentiation strategy uniquely positions itself to meet buyers' needs. A focus strategy has two variants: cost focus and differentiation focus. In cost focus, a company seeks lowest cost provision in its target segment, while in differentiation focus, a company seeks to offer products or services with different attributes in its target segment. Several empirical studies have supported Porter's generic strategy theory (Dess and Davis 1984; McNamee and McHugh 1989; Miller and Friesen 1986; White 1986).

2.3.2 Resource-Based View

Porter's work dominated the 1980s, yet a resource-based view of strategy emerged in the 1990s. The resource-based view focuses on the marshalling of internal resources to develop distinctive competence (Bartlett and Ghosal, 1991). The resource-based view of the company posits that a firm's internal processes create a resource bundle which can become the means of getting and sustaining a competitive advantage (Barney, 1991; Bates and Flynn, 1995; Schulze, 1992; Wernerfeldt, 1984). This theory rests on two key points. First, that resources are the determinants of firm performance (Barney, 1991; Schulze, 1992), and second that resources must be rare, valuable, difficult to imitate and non-substitutable by other rare resources.

Prahalad and Hamel (1990) argued that strategic thinking had been overly concerned with taking a market perspective and too little concerned with taking a core competence perspective. Sterne (1992) pointed out that Prahalad and Hamel's work was associated with the emerging focus that internal resources could be strategically used as the determinants of organisational success.

2.3.2.1 Strategic Intent

According to Hamel and Prahalad (1989), strategic intent envisions a desired leadership position and establishes the criteria/standard an organisation will use to chart its progress. The strategic intent message deviates from the more classical approaches that seek a fit between opportunities presented by the industry and the competitive position sustained by the firm to establish competitive advantage.

Strategic intent encompasses an active management process that focuses the organisation on the essence of winning, and motivates people through actions. It abandons the business unit as a central focus of strategic analysis and moves the relevant dimension of strategic concern to the corporate level of the firm (Hamel and Prahalad, 1989). Rather than matching industry opportunities with available resources, it encourages members of the firm to seek seemingly unattainable goals.

Instead of searching for advantages that are easily sustainable, it seeks to accelerate organisational learning and enable the firm to develop new rules for gaining competitive advantage.

Furthermore, strategic intent fosters investment in core competencies to develop core product capabilities instead of allocating resources to product-market units. It moves the central focus of strategy from the business level to the corporate level (Meekings et al., 1994).

2.3.2.2 Core Competence

The notion of core competencies is closely related to the resource-based view of the firm (Barney, 1991; Peteraf, 1993). According to Prahalad and Hamel (1990, p 82) core competencies are "the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies". Forster and Browne (1996) suggested that core competence is about harmonising streams of technology, improving the organisation of work and the delivery of value. They argued that core competencies require communication, involvement and a deep commitment to working across organisational boundaries. According to Keen and

Knapp (1996), a business process may become a core competence through its unique design and implementation.

According to Prahalad and Hamel (1990), there are three ways to leverage core competencies in a company. First, a core competency provides potential access to a wide variety of markets. Second, a core competency should make a significant contribution to the perceived customer benefits of the end product. Third, a core competency should be difficult for competitors to imitate.

Prahalad and Hamel (1990) disagree with the concept of the Strategic Business Unit (SBU). A SBU is a grouping of related businesses under the supervision of a senior executive. The SBU sets the over-arching strategy for each of its businesses (Hax and Majluf, 1996; Thompson and Strickland, 1999). Prahalad and Hamel (1990) suggested that too much dependence on the SBU perspective for strategic analysis has led to unacceptable autonomy at the SBU level. This leads to resources being inappropriately allocated business-by-business thereby ignoring the creation and cultivation of core competencies cutting across business units.

Prahalad and Hamel (1990) pointed out that core competencies become an alternative to the SBU as a central focus for strategic analysis. Hax and Majluf (1996) agreed with Prahalad and Hamel's ideas and stated that the SBU perspective imprisons resources at the business-unit level, and slows innovation. Core processes have to be performed either exceedingly well or in closely coordinated fashion for the organisation to develop their core competencies (Thompson and Strickland, 1999).

2.3.3 Link Between Business Process Management and Strategic Management

Core processes have two roles in strategic management. The first is in the implementation of strategy because it is some or all of the core processes that must change when a new strategic direction is established. Changes in strategy lead to core process redesign. The second is in the creation of strategy itself. Literature on the development of successful business strategies has been founded on two concepts: the market based view and the resource based view. In terms of the market-based view, strategic success is influenced mainly by attractive markets. A company's requirements for resources are determined by market forces. In terms of the resource-based view, greater innovations around a company's competencies are prerequisites for an attractive market position.

In the market-based view, companies rely on value chain analysis in winning markets (Porter, 1985; Pritchard and Armistead, 1999; Schmidt and Treichler, 1998). They compete on the differences between their value chains. The primary and support activities of the value chain are similar in concept to core and support processes. Winning strategies are build upon competitive strengths in value chains. A good fit is needed. Thus the fit between the value chain and the market-based view of strategy can be translated in terms of the fit between processes and the market-based view of strategy. Adopters of Business Process Management must therefore manage the alignment of core processes and strategy, at least from a market-based perspective.

In the resource-based view, competitive success depends on transforming core processes into strategic capabilities and the creation of new customer needs through the redesign and improvement of core processes (Keen and Knapp, 1996; Stalk et al., 1992). Strategies that do not leverage off the core competencies embedded in core processes will be risky. Adopters of Business Process Management must therefore manage the alignment of core processes and strategy at least from a resource-based view of strategy.

Therefore, Business Process Management links to both the market-based view and the resource-based view of strategy. Business Process Management can accommodate better view of strategy, provided core processes are aligned to the particular strategic perspective.

While crafting strategy is essentially a market-driven exercise, implementing strategy is an operations-driven exercise and seeks changes to core processes. It requires different work groups to align their efforts in strategy-critical sub-processes. The more silo-structured the organisation the more difficult the challenge.

2.4 Information Technology

Information Technology (IT) is changing at a rapid pace and given the growing strategic impact of IT, the need to manage it successfully is felt with urgency (Benamati et al., 1997). In recent years, there has been accelerating change in microcomputer technology, commercial software, user-manager computer competency, and telecommunications. This is evidenced by the uptake of e-commerce, the Internet and Intranets.

Gates and Hemingway (1999, p xvii) stated that "companies need ...... the ability to run smoothly and efficiently, to respond quickly to emergencies and opportunities, to quickly get valuable information to the people in the company who need it, the ability to make decisions and interact with customers". He suggested that companies require new information systems to fulfill these needs. The advancement of IT is a driver in the creation of entirely new management approaches to information systems (Dehayes et al., 1994; Gates and Hemingway, 1999; Scott-Morton, 1991).

In the following, the definitions and roles of Information Technology, benefits of Information Technology, and IT as an enabler in an organisation are described.

2.4.1 Definition and Roles of Information Technology

The following definitions of Information Technology have been offered.

> "a set of elements that consists of hardware, software, networks, workstations, robotics and smart chips" (Scott-Morton, 1991, p 4)
>
> "combination of computers, telecommunications and information resources" (Keen and Knapp, 1996, p 2)
>
> "the application of technology to business processes, gathering data and creating information that is valuable to managers who make business decisions. IT translates symbols into a useable form" (Daniels, 1994, p 36)
>
> "in a broad sense, IT as technologies dedicated to information storage, processing and communication" (Lai and Mahapatra, 1997, p 187)

Sriram et al. (1997) argued that IT should be defined broadly to encompass hardware, software, telecommunications, as well as the personnel and resources dedicated to support information technology. The role of IT is not one of automation but rather to unlock business potential. Two important roles of Information Technology are to compress business response time and provide a single point of interface (Deans and Karwan, 1994).

Scott-Morton (1991) argued that the role of IT has shifted from the traditional supportive role to the emerging strategic role. In its traditional supportive role, IT issues act as the supporting infrastructure for the implementation and administration of corporate strategies, and the allocation of resources for corporate information systems. The level of resources is based on "administrative expense" considerations rather than as business investments that could potentially reshape the organisation's strategic thrusts. In its emerging strategic role, evidenced through the popularity of e-commerce, IT offers the capability to redefine the boundaries of markets and structural characteristics, alter the fundamental rules and basis of competition, redefine business scope, and provide a new set of competitive weapons. IT offers attractive sources of strategic advantage. The role for IT within organisations can be best understood as the result of convergence of two concurrent forces, namely the technology push and the competitive pull. A summary of these is shown in Figure 2.3.

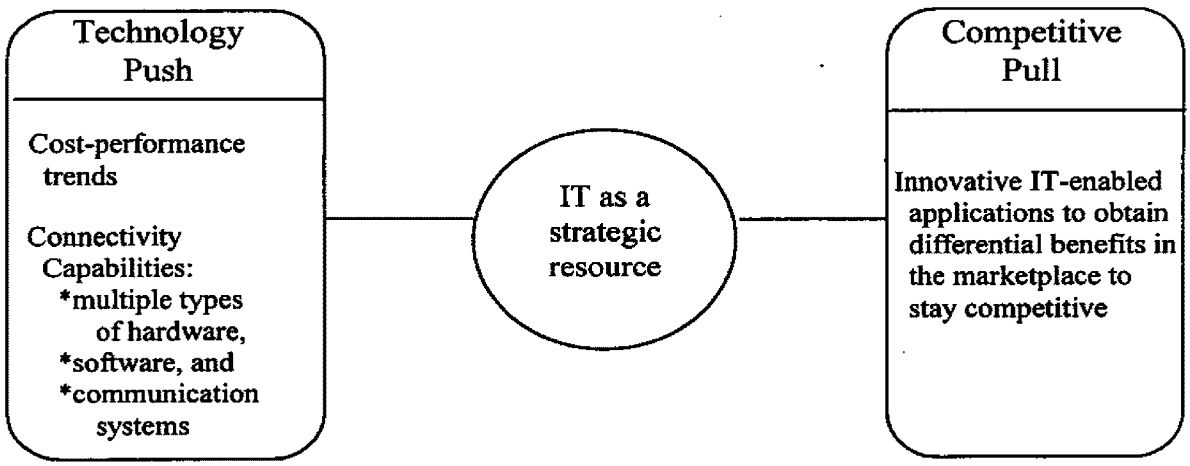


Figure 2.3 Emergence of a strategic role for IT in organisations (Adapted from Scott-Morton, 1991)

2.4.2 Opportunities for Information Technology

Information Technology has changed the business world dramatically by changing the ways in which organisations perform their operations and design and market their products and services. IT is particularly pervasive in the primary activities and support activities of value chains. It is forging linkages among the activities of all types of organisations and is disseminating information among departments without boundaries. IT provides the means to achieve the breakthrough in performance required in reengineering projects (Gadd and Oakland, 1996; Sohal and Ng, 1998).

Specifically, there are three opportunities in IT: extensive communication networks, accessible distributive databases and enhanced human interface workstations (Scott-Morton, 1991). The development of high-performance, high-reliability, comprehensive communication networks, both intraorganisationally and interorganisationally, is occurring at a rapid pace. At the same time, both hardware and software technologies are evolving in ways that make it possible to maintain extensive amounts of information online and to be able to access this information in conjunction with the communication networks from almost any location. Furthermore, the increased capability of advanced personal computers, often referred to as workstations, is providing many improvements in ease of use, enabling people to work with these systems with much less formal training yet accomplish much more complex tasks (Scott-Morton, 1991; Wladawsky-Berger, 1999). The emerging hardware, software, and communications standards will reshape business and consumer behaviour. New digital devices will handle almost every kind of data in digital format (Gates and Hemingway, 1999).

The advances of IT facilitate a level of connectivity between individuals, teams and organisations which enables a quantum leap in the quality, quantity and range of stored organisation knowledge. This connectivity may support new ways of working such as: coordination of business tasks both within and between companies, freedom of location for individuals, teams and organisations, support for group work and collaboration, and electronic marketing, purchasing and trading (Watkins, 1998). The immediate availability of accurate information changes strategic thinking from a separate, stand-alone activity to an ongoing process integrated with regular business activities. Companies require a digital nervous system that comprises the digital processes that closely link every aspect of a company's thoughts and actions (Gates and Hemingway, 1999).

2.4.3 IT as an Enabler of Business Process Management

IT is a primary driver of strategic change and reshaping processes (Yetton and Johnston, 1993). IT has been identified as being the key enabler for process improvement in various organisational initiatives aimed at improving workflow and operational efficiency (Broadbent, 1994; Dhaliwal and Ranganathan, 1997; Davenport, 1993b; Grover et al., 1993; Hammer and Champy, 1993). IT can aid in both incremental as well as radical process improvement efforts (Venkatraman et al., 1993).

According to Scott-Morton (1991), IT is an enabler of the changes in business processes and integration of business functions at all levels in an organisation. Watkins (1998) also stressed that IT has an enabling role in changing business processes, particularly regarding leadership, management control, and employee participation. Ostroff (1999) pointed out that IT is required by companies as an enabler for going horizontal. E-commerce applications are having a major impact on the redesign of business processes.

An organisation adopting Business Process Management needs to be mindful of the alignment between its core processes and its choice of IT. Legacy systems that do not support information flow across functional units will hinder an organisation's ability to go horizontal (Woodall et al., 1997).

IT and business processes are inextricably linked. Kettinger and Grover (1995) proposed a Business Process Change model that relates IT, management, people, structure and business processes as depicted in Figure 2.4.

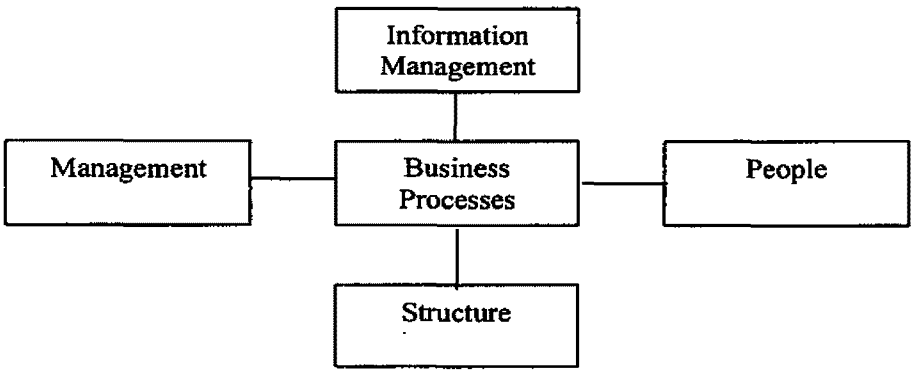


Figure 2.4 Business Process Change Model (Source: Kettinger and Grover, 1995)

This model contains transformational subsystems including business process (intra-functional, cross-functional, or inter-organisational); management (style, systems, and measures); information technology (data, information, and production technologies); people (values, skills, culture, behaviours); and formal and informal organisational structures including jobs, teams, and coordination mechanisms.

2.5 Process Improvement

In Business Process Management, organisations are required to improve their business processes (Elzinga et al., 1995; Lee and Dale, 1998). Improving business processes, called process improvement, consists of three initiatives: Continuous Improvement, Benchmarking and Process Reengineering (adapted from Hammer and Champy, 1993; Hunt, 1996; Spendolini, 1992; Suryo, 1999; Zairi and Sinclair, 1995). In the United States, Continuous Improvement programs that focused on customers and in particular on small step improvement, have been practised since the 1970's (Kelada, 1994; Zairi and Sinclair, 1995). This was then followed by Benchmarking programs in the 1980's that searched for the best practices which would lead to superior performance (Camp, 1989). Process Reengineering emerged in the 1990's. It involves the radical redesign of business processes to achieve dramatic improvement (Davenport and Short, 1990; Hammer, 1990).

In the following, a brief history, definition, characteristics and benefits of each initiative are described in more detail. This is followed by critical success factors for process improvement and methodologies of process improvement.

2.5.1 Continuous Improvement

According to Schroeder and Robinson (1991), the idea of Continuous Improvement originated from Scotland in 1871, then it migrated to the US and later to Japan. Schroeder and Robinson explain how Continuous Improvement programs were imported into Japan from the USA in the late 1940s by US military authorities. The aims were to rebuild Japanese industry quickly without a huge investment of capital and to prevent widespread starvation and unrest through increased employment. Continuous Improvement - called Kaizen in Japan (Imai, 1986) - subsequently gained popularity in Japan as a low investment, proven method of raising quality and productivity. In the late 1950's, top level management in Japanese companies started to support quality improvement initiatives. They launched company-wide quality control programs based on Deming's and Juran's ideas.

During the 1970's, Continuous Improvement programs returned to US industry (Lakhe and Mohanty, 1994; Main, 1994). This resurgence had been the result of direct Japanese investment in the USA, as well as the efforts of US companies to compete successfully with their Japanese counterparts (Jha et al., 1996).

2.5.1.1 Definition and Characteristics of Continuous Improvement

Continuous Improvement has a variety of names, including Continuous Improvement (Kelada, 1994; Zairi and Sinclair, 1995), Kaizen (Imai, 1986) and Continuous Process Improvement (Robson, 1991). Some definitions of Continuous Improvement are:

> "ongoing improvement involving everyone- top management, managers, workers..... signifies small improvements made in the status quo as a result of ongoing effort" (Imai, 1986, p xxix and 6)

> "continuous incremental process improvements..... which seek lower levels of change" (Davenport, 1993b, p 1 and 10)
>
> "small improvement made as a result of continuing effort" (Wittenberg, 1994, p 12)

Many scholars have proposed a set of characteristics for Continuous Improvement. These are:

1) *Continuous Improvement leads to incremental change in business process*

Kelada (1994) pointed out that Continuous Improvement can be viewed as an incremental change initiative, focusing on business process.

2) *Continuous Improvement provides small improvements in organisational performance*

Dale (1994) stated that Continuous Improvement is a systematic and incremental approach concentrating on the elimination of waste and non-value added activity, thus leading to small step changes in performance. According to Davenport (1993a; 1993b) and Hammer and Champy (1993), Continuous Improvement only provides improvement in the range of five to ten percent. Over a long period, however, the continuous accumulation of Continuous Improvement activities may result in dramatic improvement in organisational performance (Kano, 1993; Stoddard and Jarvenpaa, 1995).

3) *Continuous effort that involves everyone in the organisation*

Continuous Improvement is a continuous effort to improve process performance in order to increase customer satisfaction. Opportunities to develop better processes always exist (Deming, 1982a). Organisations should encourage the involvement of all employees, in teams and individually, to improve organisational performance by identifying and solving problems that are affecting their job (Povey, 1996).

2.5.1.2 Benefits of Continuous Improvement

Continuous Improvement benefits the organisation in many ways. Imai (1986) stressed that the benefits from Continuous Improvement could be described in two ways: tangible and intangible benefits. The tangible benefits of Continuous Improvement are to improve quality and productivity. The intangible benefits are improved employee morale, commitment and participation. According to Harber et al. (1993) and Tanner and Roncarti (1994), Continuous Improvement initiatives improve the climate for organisational change, reduce resistance to change and help to unfreeze the organisation.

Deming (1982b) pointed out that Continuous Improvement improves the quality of products and services to the customer. He described a chain reaction to explain how improving quality can help a company stay in business. First, improvement in quality will increase productivity, followed by lower unit costs. Lower unit costs will increase profit and subsequently an increase in return on investment. This in turn may help companies to stay in business. According to Berry (1991) and Dale and Boaden (1994), Continuous Improvement increases organisational effectiveness through teamwork, inter-unit cooperation and employee involvement.

Luthans and Kessler (1993) stated that organisations should never be satisfied with the existing level of quality and should constantly be striving for Continuous

Improvement. This view was supported by Gondhalekar et al. (1995) and Gondhalekar and Karamchandani (1994).

2.5.2 Benchmarking

Interest in Benchmarking in the US has virtually exploded since 1979 when Xerox pioneered Benchmarking by comparing its US products with those of its Japanese affiliate Fuji-Xerox (Anderson and Camp, 1995). In today's competitive environment, companies are under constant pressure to improve their operations, setting their standards against the best in the world. Benchmarking is a process that helps practising managers do this. The meaning of Benchmarking has evolved from competitor product comparison, to manufacturing cost comparison, problem-based Benchmarking and then to Business Process Benchmarking. According to Camp (1995) and Povey (1996), the form of Benchmarking which focuses on business process has come to be seen as the most favoured approach.

2.5.2.1 Definition and Characteristics of Benchmarking

Many definitions of Benchmarking have been offered in the literature and many are similar. Definitions of Benchmarking include:

> "the search for and implementation of best practices. The adoption or adaptation of the best practices allows an organisation to raise the performance of its products, services, and business processes to leadership levels" (Camp, 1995, p 15)
>
> "the continuous process of measuring our products, services, and practices against our toughest competitors or those companies known as leaders" (Xerox, in Camp, 1995, p 18)
>
> "the search for industry best practices that lead to superior performance" (Camp, 1989, p 12)

> "a continuous, systematic process for evaluating the products, services and work processes of organisations that are recognised as representing best practices for the purpose of organisational improvement" (Spendolini, 1992, p 8)

> "the continuous process of comparing a company's strategy, products, and processes with those of world leaders and best-in-class organisations in order to learn how they achieved excellence, and then setting out to match and even to surpass it" (Ross, 1995, p 235)

> "a method for organisational improvement that involves continuous, systematic evaluation of the products, services and processes of organisations that are recognised as representing best practices" (Macneil et al., 1993, p 2)

Considering the preceding definitions, the characteristics of Benchmarking are:

1) *Seeks best practices externally*

Benchmarking exploits improvement opportunities identified by looking outside a firm's operations (Evan, 1994). Performance improvements are derived from understanding how best practice is achieved (Macneil et al., 1993). Benchmarking focuses on the discovery of a new idea from an external source (Camp, 1989). The external source may range from another department within the same company, another company in the same industry, to another company in an unrelated industry (Camp, 1989; Cross and Leonard, 1994).

2) *Systematic and continuous improvement*

Benchmarking is a formal or structured method of searching for best practice (Macneil et al., 1993; Spendolini, 1992). Benchmarking focuses on the improvement of business processes. Benchmarking is treated as an ongoing effort and may be viewed as a part of continuous improvement (Best Practice Program, 1993; Macneil et al., 1994; Povey, 1996; Spendolini, 1992).

3) *Compares process best practice*

By comparing both processes, a new idea from the Benchmarking partner may be discovered (Ross, 1995). Ideas from the best practice process should be translated to the organisation's process to improve organisational performance. According to Macneil et al. (1994), a best practice process usually cannot be translated without some modification. Zairi and Hutton (1995) stated that Benchmarking might provide a dramatic improvement in process performance by adapting a best practice's process into an inferior performing process.

2.5.2.2 Benefits of Benchmarking

Benchmarking benefits the organisation in many ways. According to Ross (1995), Benchmarking may provide benefits in the utilisation of human resources. The gap between a company's performance and best practice performance may motivate employees to undertake continuous improvement (Ross, 1995). Benchmarking may transform employee complacency into a desire to improve (Harrington, 1991). Benchmarking increases employee satisfaction through involvement and empowerment (Bogan and English, 1994).

Benchmarking provides realistic targets for performance improvement and ideas to improve the business process (Harrington, 1991). Camp (1989, p 33) stated that "the Benchmarking process by its nature challenges the current way of doing business by bringing in new ideas and practice from the outside". By adopting the best practice process, Benchmarking can create a dramatic performance improvement and ultimately result in an organisation becoming more competitive.

Benchmarking helps establish realistic and credible targets because the same targets have been achieved by another company. Camp (1989, p 31) pointed out that "If goals are based on industry best, not only do they meet industry best, but also unarguable." Benchmarking helps to convince sceptical employees that the targets set by management are credible and attainable, at least by other companies. Benchmarking may overcome management complacency and create momentum for change. The emphasis on looking to other companies tends to overcome the "not invented here" syndrome (McGonagle and Fleming, 1993; Ross, 1995). Benchmarking reinforces a broad commitment to change and fosters communication of a shared vision (Best Practice Programs, 1993).

2.5.3 Process Reengineering

During 1984 to 1989, researchers in the Massachusetts Institute of Technology research program 'Management in the 1990s' observed an interesting phenomenon. Some companies, such as Ford, Xerox, MBL successfully applied IT systems in an innovative way. Rather than simply automating operational tasks, they transformed tasks completely (Burke and Peppard, 1995; Davenport and Short, 1990). In their seminal articles, Hammer (1990) and Davenport and Short (1990) popularised this idea by offering Process Reengineering as a change management strategy when small incremental improvement in organisations was too late or too little to satisfy an organisation's requirements.

2.5.3.1 Definition and Characteristics of Process Reengineering

The literature includes many different terms relating to Process Reengineering, including Business Process Redesign (Carr, 1993; Davenport and Short, 1990), Process Innovation (Davenport, 1993b), Core Process Redesign (Hagel, 1993; Heygate, 1993; Kaplan and Murdoch, 1991), and Business Restructuring (Talwar, 1993; Tanswell, 1993), as well as Process Reengineering (Kettinger et al., 1995). This has led to much confusion as to what constitutes Process Reengineering. Definitions of Process Reengineering include:

> "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed" (Hammer and Champy, 1993, p 32)
>
> "to rethink, restructure and streamline the business structures, process, method of working, management systems and external relationship through which we create and deliver value" (Talwar, 1993, p 23)
>
> "the analysis and design of flows and processes within and between organisations" (Davenport and Short, 1990, p 11)
>
> "the redesign and improvement of a business process both in depth (roles and responsibilities, measurement and incentives, organisational structure, information technology, shared value and skills) and breadth (activities to be included) which can lead to long term profit" (Hall et al., 1993, p 122)
>
> "organisational initiative to accomplish strategy driven design of business processes to achieve competitive breakthrough in quality, responsiveness, cost, flexibility and satisfaction" (Kettinger et al., 1995, p 211)
>
> "the rapid and radical redesign of strategic, value-added business processes- and the systems, policies, and organisational structure that support them- to optimise the work flows and productivity in an organisation" (Manganelli and Klein, 1994, p 31)

What all these terms have in common is the concept of processes, and the need to improve both their performance and design (Gadd and Oakland, 1996; Zairi and Sinclair, 1995). In the following, the characteristics of Process Reengineering are discussed in more detail.

1) *Focus on radical change*

The reengineered business processes have to be fundamentally different from the existing processes. The reason is that the competitive environment has changed radically. The way companies did business in the past is no longer valid for the future. Hammer (1990) claims that automating the existing process is just speeding up inefficient outdated ways of doing business, and it is not a radical change. To address fundamental performance deficiencies, it is necessary to reengineer a business process by disregarding existing structures and procedures.

2) *Focus on dramatic improvement*

To gain or sustain competitive advantage, small step continuous improvement is no longer considered enough. Dramatic improvement can only be achieved by creating radical change in business processes (Sethi and King, 1998).

3) *Focus on business process*

Process Reengineering views an organisation as a collection of business processes, not in terms of individual functions, products or services (Tinnila, 1995). Hammer (1996) stressed that organisations must focus on business processes in the Process Reengineering projects.

4) *Top-down approach.*

Because of the level of change involved, Process Reengineering requires senior executive leadership. Only the top level management can be expected to have a clear vision of the company, identify the opportunities for radical change, access the resources required and exercise the power to make change happen. Lower levels of management usually lack these qualities and need to be led and motivated to adopt Process Reengineering (Jones, 1995). Stoddard et al. (1996) found Reengineering is directed top-down only in the design phase. The implementation phase requires acceptance from the bottom-up.

2.5.3.2 Benefits of Process Reengineering

Process Reengineering benefits the organisation in many ways. Hammer and Champy (1993) stressed that companies may become more responsive, competitive, innovative, efficient, customer focused, and profitable through Process Reengineering. According to Davenport (1993b), Process Reengineering benefits companies in reducing cycle time, removing unnecessary activities, and responding to the need for the better coordination of activities.

Manganelli and Klein (1994) reasserted these benefits. They pointed out that these benefits will lead to the improvement of productivity, and provide opportunity to achieve the business goals of both profitable revenue growth and market share expansion.

Andrews and Stalick (1994) pointed out that the other benefits that can be achieved by Process Reengineering are: (1) increase the organisation's ability to customise products and services; (2) increase customer satisfaction, (3) improve individual capability for contribution so that people experience ownership of their work and see their contribution to the organisation. According to Roberts (1994), Process Reengineering can improve a companies' competitive advantage.

2.5.4 Critical Success Factors for Process Improvement

Process Improvement consists of three initiatives: Continuous Improvement, Benchmarking and Process Reengineering (adapted from Hammer and Champy, 1993; Hunt, 1996; Spendolini, 1992; Suryo, 1999; Zairi and Sinclair, 1995). These three initiatives share common goals. They all attempt to improve organisational performance by changing business processes. Therefore, there should be similarities among the success factors of Continuous Improvement, Benchmarking and Process Reengineering programs.

Many researchers and practitioners have identified success factors for Continuous Improvement (Gadd and Oakland, 1996; Tenner and DeToro, 1992; Zairi and Sinclair, 1995; Imai, 1986), Benchmarking (Best Practice Program, 1993; Povey, 1996; Ross, 1995), and Process Reengineering (Ascari et al., 1995; Champy, 1995; Romney, 1995; Towers, 1993).

The critical success factors of Process Improvement are identified by examining the similarity of the success factors of Continuous Improvement, Benchmarking and Process Reengineering programs. The following critical success factors for Process Improvement are:

1) *Top level executive commitment*

Top level executive commitment is critical for the success of all three Process Improvement initiatives (Brown et al., 1994; Camp, 1989; Fox, 1991; Kaplan and Murdoch, 1991; Oakland, 1995; Povey, 1996; Towers, 1993). Top executives must provide substantial time and real commitment to Process Improvement (Bashein et al., 1994; Champy, 1995; Hall et al., 1993; Towers, 1993). Visible commitment must be sustained throughout the duration of Process Improvement programs (Bashein et al., 1994; Brown et al., 1994; Homa, 1995). Process Improvement requires substantial vision, active involvement and support by top executives (Champy, 1995; Gadd and Oakland, 1996; Miles et al., 1995; Povey, 1996; Spector, 1995; Trahant and Burke, 1996). Rowland and Armistead (1996) suggested that commitment from top executives is very important and this responsibility cannot be delegated. Top executives should treat Process Improvement with the same importance as any other strategic priority.

2) *Employee empowerment*

Employee empowerment is the key to successful Continuous Improvement (Tenner and DeToro, 1992; Waldman, 1994), Benchmarking (Ross, 1995) and Process Reengineering (Ascari et al., 1995; Furey, 1993). Employee empowerment may be achieved by increasing employee involvement and giving employees greater autonomy in decision-making (Allender, 1994; Powell, 1995; Waldman, 1994). Oakland (1999) recognised that people's roles and responsibilities must be related to the process in which they work.

3) *Organisational Support*

Organisational support is needed in Continuous Improvement (Tenner and DeToro, 1992; Waldman, 1994), Benchmarking (Camp, 1995) and Process Reengineering (Ascari et al., 1995; Furey, 1993). Support involves implementing a training and education program, and providing the necessary resources and commitment (Bashein et al., 1994; Best Practice Program, 1993; Furey, 1993). Having sufficient funds for investment in training and new information technologies is important to support Process Improvement initiatives (Bashein et al., 1994; Romney, 1995; Towers, 1993).

4) *Horizontal communication*

Horizontal communication encourages people to learn from one another and work cooperatively to problem solve between areas that need to work together (Ostroff, 1999). Communication with interest groups inside and outside the organisation is important to sustain organisational understanding and tolerance for Process Improvement initiatives (Ascari et al., 1995; Camp, 1989; Homa, 1995). Communication to the employees has to be kept open (Romney, 1995).

5) *Use of cross-functional teams*

Process improvement initiatives rely on cross-functional teams (Daly and Freeman, 1997). According to Rummler and Brache (1995, p 167), "a cross–functional team is a small group of individuals that cross formal departmental boundaries and level of hierarchy". Continuous Improvement, Benchmarking and Process Reengineering emphasise the use of teams to improve business processes (Camp, 1995; Gadd and Oakland, 1996; Morgan and College, 1995). All teams members in cross-functional teams must be trained properly to conduct Process Improvement initiatives (Leth, 1994).

Cross-functional teams are necessary for Continuous Improvement (Imai, 1986; Ross, 1995), Benchmarking (Camp, 1989) and Process Reengineering (Hammer and Champy, 1993; Rowland and Armistead, 1996).

2.6 Performance Measurement Systems

The success and continuity of an organization depend on its performance, which may be defined as "the way the organization carries its objectives into effect" (Douwe et al., 1996, p 28). This requires that every employee contributes to the organisation's objectives via his or her activities. Organisations manage their performance through performance measurement systems. Neely (1998, p 5) stated "a performance measurement system enables informed decisions to be made and actions to be taken because it qualifies the efficiency and effectiveness of past actions through the acquisition, collation, sorting, analysis, interpretation and dissemination of appropriate data".

Performance measurement systems are composed of three elements: performance criteria, performance measures, and performance standards (Crawford et al., 1988). Performance criteria are the relative elements used to evaluate performance. The actual values of performance criteria over some specified time period are the performance measures. Performance standards are the accepted levels of performance for each criteria. Performance measurement systems provide a means for:

(1)·maintaining alignment between strategic objectives and market requirements; (2)·coordinating the effective use of company resources; and (3)·monitoring progress toward the achievement of pre-determined strategic objectives. Thus, a performance measurement system is required for each pre-determined objective to serve as a mechanism for monitoring progress.

The measures used to evaluate a company's performance have historically been financial ones, such as the monetary value of sales and profits or percentage return on monetary investment. Because external groups place a strong emphasis on such financial measures, the internal performance measurement systems used within companies have also tended to be financial, usually focusing on costs (Elnicki, 1971). The cost accounting systems used today, which include measures of efficiency and variance, represent an effort to relate internal performance measures to external ones.

The usefulness of these cost accounting systems in guiding a company towards the correct strategic competitive decisions, especially related to manufacturing, has been questioned by several authors (Hayes, 1980; Johnson, 1987; Kaplan, 1984). The response to this challenge from accountants has been in the form of a new approach to cost accounting, known as activity-based costing (ABC) (Cooper, 1988; Kaplan, 1989).

Kaplan and Norton (1992), Nanni et al. (1992) and Neely et al. (1994) emphasise the need to integrate measurement activities throughout the organisation, and to link these with strategic objectives. The basic expression of this ideal can be seen in Dixon , Nanni, and Vollmann's (1990) strategy, action and measure triangle. Placed within a manufacturing environment, its emphasises the need to link each strategic objective to measure or group of measures, and implement the strategy with a course of action or actions such as Just in Time, Total Quality Control, or others.

The integrated approach to the use of performance measures has been well presented by Kaplan and Norton's (1992) Balanced Scorecard Model. Here performance measures are linked to goals from four perspectives: financial, customer, internal business, and innovation and learning. The focus on the external, competitive environment is not specified in a single separate category but is incorporated in a customer perspective – "how do customer are see us?" and in an internal business perspective – "what must we excel at?". The value of the balanced scorecard approach is that it provides management with a variety of perspectives from which to view performance without suffering from an information overload. The necessity for a performance measurement system to be thorough and strategic yet avoid complexity was also raised by Dixon et al. (1990).

2.7 Relationship to the Research

BPM is an integrated management approach that includes process improvement initiatives (Continuous Improvement, Process Reengineering, Benchmarking), emphasises people and technology, and advocates a process view of the organisation that is linked to its strategy. Business Process Management requires organisations to adopt a disciplined approach towards managing three main aspects of process management:

(1) Creating alignment between the elements of an organisation and process

Three elements of an organisation that impact core processes are structure, information technology, and strategy (Scott-Morton, 1991; Yetton and Johnston, 1993). BPM advocates alignment between structure and core processes, information technology and core processes, and strategy and core processes. One basic tenet of BPM is for these three requirements for alignment to occur simultaneously. The model proposed in this research develops variables to measure the extent of these alignments.

(2) Involving people at all levels in the management of processes

Top management commitment and people empowerment are needed to implement Continuous Improvement and Process Reengineering successfully (Ascari et al, 1995; Kaplan and Murdoch, 1991; Suryo, 1999; Zairi, 1996). Continuous Improvement and Process Reengineering is part of BPM (Povey, 1996). The model proposed in this research develops variables to measure the extent to which organisations have top management commitment and employee empowerment in place.

(3) Adopting a disciplined approach to process improvement

Process improvement includes incremental and radical change of business processes (Zairi, 1996). It consists of three types of process improvement initiatives: Continuous Improvement, Process Reengineering and Benchmarking (adapted from Hammer and Champy, 1993; Hunt, 1996; Spendolini, 1992; Suryo, 1999; Zairi and Sinclair, 1995). Organisations seeking process improvement may have varying degrees of success with each initiative. The model proposed in this research develops variables to measure the success of Continuous Improvement, Process Reengineering and Benchmarking initiatives in organisations. The next chapter will build upon these three basic tenets of BPM to develop a research model which relates organisational performance to BPM capability.

CHAPTER 3

RESEARCH MODEL AND HYPOTHESES

This chapter consists of three sections. In the first section, a research model that describe how Business Process Management influences business performance is introduced based on the prior literature review in Chapter 2. In the second section, variables comprising the model are discussed. In the third section, thirteen hypotheses relating to the model are discussed.

3.1 Research Model Development

Organisations are achieving a transformation to new performance levels by focusing on business processes. In fact, thinking in terms of business processes provides a new analytic framework that helps break the mould of "thinking only in terms of functional unit". In turn, new team concepts, tools and methodologies are emerging to support the analysis, improvement and management of processes (Harrison and Pratt, 1993).

Business Process Management is an integrated management approach and set of practices based on core processes that emphasises (1) alignment of organisational structure, strategy, and information technology on processes; (2) significant people involvement at senior and operation levels; and (3) capability in process improvement (adapted from Elzinga et al, 1995; Hammer, 1996; Keen and Knapp, 1996; Moreton and Chester, 1997; Zairi, 1997). Business Process Management requires organisations to adopt a disciplined approach to:

(1) Creating alignment between the elements of the organisation and processes. These elements are structure, strategy and information technology;

(2) Involving people at all levels in the management of processes; and

(3) Adopting a disciplined approach to process improvement.

A construct, Process Management Capability (PMC), will be introduced to measure how well an organisation follows these three approaches. Process Management Capability will be an aggregate of three variables: Process Alignment, People Involvement and Process Improvement Competency.

Process Alignment measures the alignment between the elements of an organisation and its processes. People Involvement measures the extent of the involvement of all people in the management of processes. Process Improvement Competency measures the capability of an organisation in successfully implementing process improvement programs.

According to Rummler and Brache (1995), two levels of business performance are: the organisational level of performance and the process level of performance. This thesis measures both.

Adapted from the International Benchmarking Clearinghouse (1995) and Arthur Andersen (1998), companies engage in six types of core processes. These core processes are: (1) the process for determining customer needs; (2) the process for monitoring changes in customer expectations; (3) the process for designing new products and services; (4) the process for providing products and services to customers; (5) the process for billing customers; and (6) the process for providing after-sales services.

In this chapter, a research model is proposed to examine the relationship between: (1) Process Management Capability and Organisational Performance; (2) Process Management Capability and the performance of core processes; (3) Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance. The model will also be used to describe the mechanism that relates Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance. It will also examine the interaction effects of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance. This model is depicted in Figure 3.1. Definitions of all variables follow.

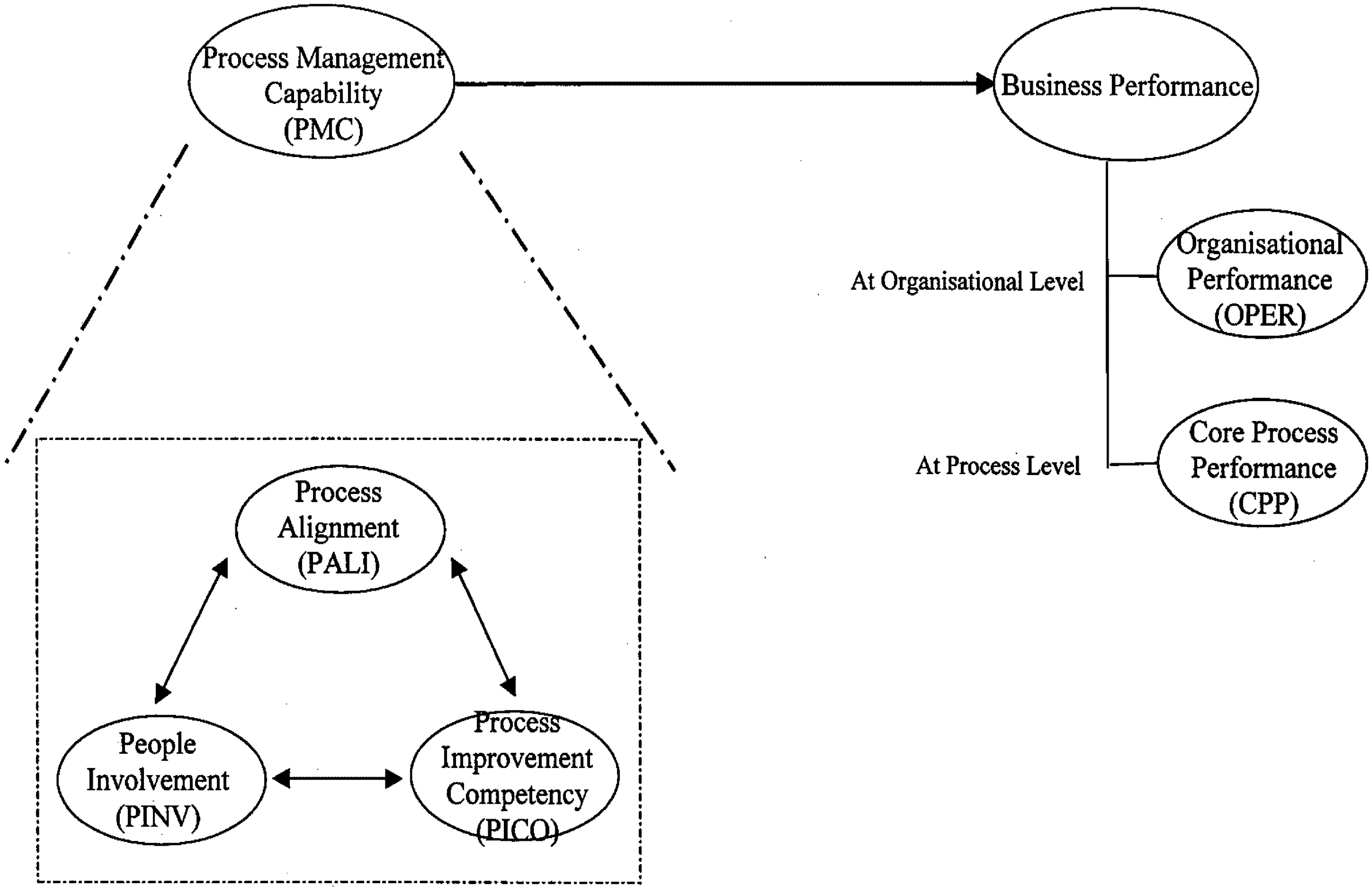


Figure 3.1 The Research Model: the relationship between Process Management Capability and Business Performance

3.2 Variables in the Research Model

In the following, independent and dependent variables in the research model are discussed.

3.2.1 Independent Variables

This research model comprises three independent variables - Process Alignment (PALI), People Involvement (PINV), and Process Improvement Competency (PICO). These aggregate to form the construct Process Management Capability (PMC).

3.2.1.1 Process Alignment (PALI)

Organisational effort is needed to make processes the platform for strategic planning, for the choice of information technology, and for the choice of organisational structure (adapted from Hammer, 1996; Spector, 1995).

Process Alignment measures the alignment between organisational structure and processes, information technology and processes, and the company's strategy and processes.

Alignment between organisational structure and processes examines: (1) barriers between departments; (2) use of process teams; (3) authority of cross-functional teams; (4) horizontal communication, and (5) type of organisational structure.

Alignment between information technology and processes examines: (1) IT as an enabler in business processes; (2) information technology is state-of-the-art; (3) data sharing by employees; (4) use of IT in business process improvement; and (5) IT systems integrated across functional units.

Alignment between company's strategy and processes examines: (1) developing strategies based on customer needs; (2) management team identifying core processes; (3) the relationship between operational improvements and their impact on the organisation's ability to compete; (4) performance measurement; (5) information sharing and cross-functional cooperation.

3.2.1.2 People Involvement (PINV)

People Involvement measures the extent of the involvement of people at all levels in the management of core processes. It consists of sponsorship and support from top level management and the realignment of power, knowledge and information to the lower levels in the organisation (adapted from Pace, 1989; Bounds et al., 1994).

Sponsorship and support from top level management examines: (1) training in managing core processes; (2) knowledge on how to manage core processes; (3) communication between top level management and other employees; (4) recognising the need to identify core processes; and (5) resources allocated by top levels of management to improve core processes.

Realignment of power, knowledge and information to the lower levels in the organisation examines: (1) delegation of managerial tasks to front-line staff; (2) employee involvement in job planning; (3) employees' autonomy in making decisions; (4) developing problem solving skills; and (5) interaction with external customers.

3.2.1.3 Process Improvement Competency (PICO)

Process Improvement Competency measures the extent to which a company is successful in implementing process improvement initiatives. These initiatives consist of Continuous Improvement, Process Reengineering and Benchmarking (adapted from Hammer and Champy, 1993; Hunt, 1996; Spendolini, 1992; Suryo, 1999).

Competency in Continuous Improvement, Process Reengineering and Benchmarking is measured by: (1) the duration of activity; (2) volume of activities; (3) number of employees involved; (4) type of methodology; (5) perceived level of success; and (6) contribution to bottom-line improvement.

3.2.1.4 The Construct - Process Management Capability (PMC)

Process Management Capability is the extent to which an organisation aligns its processes and the elements of an organisation, involves all people in process management, and successfully adopts process improvement programs. Process Management Capability is measured as the aggregate of Process Alignment, People Involvement and Process Improvement Competency.

3.2.2 Dependent Variables

There are two levels of business performance: the organisational level of performance and the process level of performance (Rummler and Brache, 1995). These constitute the dependent variables in the research model in Figure 3.1. The organisational level of performance, called Organisational Performance, measures performance in a holistic way, according to the expectations of external stakeholders. These may include owners, investors, customers, regulators, and society. The process level of performance, called Core Process Performance, is the extent to which an organisation ensures that its core processes meet customer needs and work efficiently (adapted from Rummler and Brache, 1995). The following sections define the variables Organisational Performance and Core Process Performance respectively.

3.2.2.1 Organisational Performance (OPER)

The first dependent variable in the research model is Organisational Performance. This variable measures: (1) organisation competitive position; (2) productivity of employees; (3) organisation profitability; (4) the quality of products and services; and (5) average cost per unit of product or service (adapted from AP &QC, 1995; Arthur Andersen Consulting, 1998; Lawler et al., 1998; Powell, 1995).

3.2.2.2 Core Process Performance (CPP)

The second dependent variable in the research model is Core Process Performance. This variable examines the performance of each of the six core processes. They are: (1) the process for determining customer needs; (2) the process for monitoring changes in customer expectations; (3) the process for designing new products and services; (4) the process for providing products and services to customers; (5) the process for billing customers; and (6) the process for providing after-sales services.

3.3 Research Hypotheses

Thirteen research hypotheses that examine the relationship between dependent and independent variables are derived from the literature review. The first four hypotheses examine the relationship of Process Alignment, People Involvement, Process Improvement Competency and Process Management Capability on Organisational Performance. This is followed by three hypotheses that examine the interaction between (1) Process Alignment and People Involvement; (2) Process Alignment and Process Improvement Competency; and (3) People Involvement and Process Improvement Competency; each with Organisational Performance. The next six hypotheses examine the relationship between Process Management Capability and the performance of each of the six core processes in terms of Core Process Performance.

3.3.1 Hypothesis 1 to Hypothesis 4

3.3.1.1 Hypothesis 1: Process Alignment and Organisational Performance

Process Alignment (PALI) measures alignment between organisational structure and processes, information technology and processes, and the company's strategy and processes.

The literature argues that alignment between organisational structure and processes, the so-called horizontal organisation, is desirable for performance improvement. The reasons are as follows:

A horizontal organisation produces a level of cooperative effort that fosters innovative competitiveness and encourages more responsive decision cycles and cost savings. It does this through a more effective, flatter organisational structure (Chung, 1994; Klaus, 1989). Ostroff and Smith (1992) state that there is a significant performance leverage in moving toward a flatter, more horizontal mode of organisation. According to Hall et al. (1993), horizontal organisations, those who manage their business processes cross-functionally, have significantly better performance than organisations who confine the management of business processes to traditional functions. Organisations considered best in their class have recognised the need to move away from the traditional functionally-based approach to managing through a process-based approach (Coleman, 1991; Sinclair, 1994; Snowden, 1991).

Numerous prior studies shown that new IT capability alone does not produce sustainable performance, it must be carefully integrated into the organisation over time (Gagnon and Dragon, 1998; Luftman et al., 1993; Powell and Dent-Micallef, 1997). IT is the main instrument for dealing with the need to increase productivity in an environment of increasing competition (Gagnon and Dragon, 1998). Organisations should align IT and processes to obtain the full benefits from IT investment (Sohal and Ng, 1998).

Today, most world-class organisations are building telecommunication networks and information systems to allow effective sharing of information and databases among different parts of the organisation as well as with customers, dealers, and suppliers (Iversen, 1990). However, problems with Information Technology acquisition in organisations include: (1) confusion over the responsibility for managing the information technology; (2) users/operators act as important but uninvolved actors; (3) an incomplete implementation phase focused solely on the design capability of information technology; and (4) lack of reorganisation of work on the basis of the new technologies (Gagnon and Dragon, 1998).

Performance improvement in organisations is not only due to the IT itself, but also depends on how well it is integrated into business processes (Gagnon and Dragon, 1998). When a process view is taken in designing and installing an IT system, it becomes possible to reduce integration problems and enhance the performance of cross-functional, cross-divisional and even cross-company processes (Davenport and Short, 1990; Dennis et al., 1994; Short and Venkatraman, 1992; Taylor and Williams, 1994; Venkatraman, 1991).

Strategic planning is being considered in terms of core process improvement plans as well as traditional functional plans. Many organisations seek to increase their performance by improving the alignment of strategic planning and changes to core processes (Hinterhuber, 1995; Lee and Dale, 1998; Schmidt and Treichler, 1998; Zairi, 1997).

Process Alignment (PALI) covers the alignment between organisational structure and processes, information technology and processes, and company's strategy and processes. The literature suggests that all of these alignments are positively associated with organisational performance. Therefore, one would expect Process Alignment (PALI) to be positively associated with Organisational Performance (OPER).

The first hypothesis is:

H 1 Process Alignment is positively associated with Organisational Performance

3.3.1.2 Hypothesis 2: People Involvement and Organisational Performance

People Involvement (PINV) consists of sponsorship and support from top executive management and the realignment of power, knowledge and information to the lower levels in the organisation.

Executive commitment has a significant influence on organisational performance. According to Tushman et al. (1988) and Bennis and Nanus (1985), three key roles for executive leadership are: envisioning, energizing, and enabling. Commitment of top level management on envisioning, energizing, and enabling is needed for a successful change in an organisation. Successful change in turn leads to better organisational performance (Cumming and Worley, 1997). Top level management must consistently reflect its commitment through the organisation's philosophy, goals, policies, priorities, and behaviours (Shetty, 1991).

Numerous studies have observed a significant impact of top executive commitment on aspects of organisational performance, such as sales turnover, productivity of employees, and the market value of the organisation (Huselid, 1995; Konovsky and Cropanzano, 1991; Mayer and Schoorman, 1992; Meyer and Allen, 1997; Moorman et al., 1993; Powell, 1995; Sager and Johnston, 1989).

Employee empowerment also has a significant influence on organisational performance. Pickering and Matson (1992) noted that empowerment means building a shared vision of where the organisation needs to go and crafting an organisational culture and climate with operating values that enable all employees to participate actively and creatively in pursuing the vision. According to Lawler and Ledford (1982), employee empowerment can improve employee motivation, particularly when it satisfies important individual needs. Motivation is the willingness to exert high levels of effort toward organisational goals in order to satisfy some individual need (Robbin et al., 1994). Motivation is translated into improved performance when people have the necessary skills and knowledge to perform well and when the technology and work situation allows people to affect performance.

Numerous previous studies have indicated that employee empowerment can result in very positive outcomes for an organisation (Arthur, 1994; Denison, 1990; Hansen and Wernerfelt, 1989; Huselid, 1995; Kallenberg and Moody, 1994; Kizilos et al., 1994).

The link between empowerment and organisational performance is also supported by Vogt and Murrell (1990). According to Vogt and Murrell (1990), employee empowerment can increase employee participation and communication.

Empowerment connects the individual with others and creates a sense of personal worth that brings a sense of self-fulfillment. When employees are empowered they can produce their best by working individually and/or as part of a team. The result is a higher level of organisational performance.

People Involvement (PINV) consists of commitment from top level management and empowerment at the lower levels in the organisation. The literature suggests that commitment from top level management and empowerment at the lower levels in the organisation are both positively associated with organisational performance. Therefore, one would expect People Involvement (PINV) to be positively associated with Organisational Performance (OPER).

The second hypothesis is:

H 2 People Involvement is positively associated with Organisational Performance

3.3.1.3 Hypothesis 3: Process Improvement Competency and Organisational Performance

Process Improvement Competency measures how capable an organisation is in implementing process improvement initiatives. Capability is a measure of both duration and success. Process improvement initiatives include Continuous Improvement, Process Reengineering and Benchmarking (adapted from Hammer and Champy, 1993; Hunt, 1996; Spendolini, 1992; Suryo, 1999; Zairi, 1996). Process Improvement Competency is the aggregate of an organisation's capabilities in implementing Continuous Improvement, Process Reengineering and Benchmarking.

Continuous Improvement programs have a significant influence on organisational performance. Continuous Improvement represents the creation of positive incremental change through the involvement of operatives (Hill and Wilkinson, 1995; Choi and Chan, 1997). Continuous Improvement is a continuous effort to improve process performance to increase customer satisfaction. Opportunities to develop better processes always exist (Deming, 1982).

According to Hammer and Champy (1993), an incremental change in a business process provides an incremental improvement in organisational performance. Numerous studies have recognised Continuous Improvement as one of the tools for improving organisational performance (Berry, 1991; Bradley, 1991; Davenport, 1993a; Garvin, 1988; Harrington, 1995; Hunt, 1995; Porter, 1993; Whitford and Andrew, 1994).

Process Reengineering programs also have a significant influence on organisational performance. Process Reengineering is defined as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed (Hammer and Champy, 1993, p 32). Organisations, which are successful in implementing Process Reengineering programs, achieve dramatic performance improvements (Drew, 1996; Guimaraes and Bond, 1996; O'Neill and Sohal, 1998).

Craig and Yetton (1994) suggested that each process to be engineered will have one, two or three generic objectives - to reduce time, to reduce cost or to increase flexibility of delivery. Each objective must aim to improve performance against customer expectations.

Hammer and Champy (1993) also noted that adopting Process Reengineering programs would help organisations to realise dramatic improvements in organisational performance. Their view was supported by Guimaraes and Bond (1996), Guha et al. (1997), Kettinger et al. (1995), Lowenthal (1994), Roberts (1994), and Sethi and King (1998).

Benchmarking programs also have a significant influence on organisational performance. Benchmarking represents a continuous and systematic improvement process based on evaluating the products, services, and processes of an organisation that represents best practice and adopting them for the purpose of organisational improvement (adapted from Camp, 1989; Finnigan, 1996; Spendolini, 1992). It provides realistic targets for performance improvement and new ideas to improve business processes (Harrington, 1991).

Port and Smith (1992) stated that Benchmarking is a key strategy for improving organisational performance. The International Benchmarking Clearinghouse (1995), a database of guidelines and best practices, points out that 80 percent of companies regard Benchmarking as a condition for survival.

According to Camp (1995), by adopting the best practice process, Benchmarking can create a dramatic performance improvement in an organisation. Numerous studies have also recognised Benchmarking Competency as a way to increase organisational performance (Brocka and Brocka, 1992; Bracken, 1992; Edosomwan, 1991; Evans, 1994; Finnigan, 1996; Hunt, 1995; Macneil et al., 1994; Murray, 1991; Porter, 1993).

Process Improvement Competency measures the level of success in the three process improvement initiatives: Continuous Improvement programs, Process Reengineering programs, and Benchmarking programs. The literature suggests that Continuous Improvement programs, Process Reengineering programs, and Benchmarking programs are all positively associated with organisational performance. Therefore, one would expect Process Improvement Competency (PICO) to be positively associated with Organisational Performance (OPER).

The third hypothesis is:

H 3 Process Improvement Competency is positively associated with Organisational Performance

3.3.1.4 Hypothesis 4: Process Management Capability and Organisational Performance

Process Management Capability is an aggregate of the three variables: Process Alignment, People Involvement, and Process Improvement Competency.

Referring to hypotheses H1 to H3, the expectation is that Process Alignment, People Involvement and Process Improvement Competency are all positively associated with Organisational Performance. Therefore, one would expect that Process Management Capability (PMC), their aggregate, should also be positively associated with Organisational Performance (OPER).

The fourth hypothesis is:

H 4 Process Management Capability is positively associated with Organisational Performance

3.3.2 Hypothesis 5 to Hypothesis 7

Hypotheses 1, 2 and 3 suggested that Process Alignment (PALI), People Involvement (PINV) and Process Improvement Competency (PICO) are individually positively associated with Organisational Performance (OPER).

Prior to this thesis, there have been no published studies on the interactions of Process Alignment (PALI), People Involvement (PINV) and Process Improvement Competency (PICO) on Organisational Performance (OPER). Specifically, the literature has not examined the interaction of Process Alignment and Process Improvement Competency (PALI*PICO) on Organisational Performance (OPER); the interaction of Process Alignment and People Involvement (PALI*PINV) on Organisational Performance (OPER); and the interaction of People Involvement and Process Improvement Competency (PINV*PICO) on Organisational Performance (OPER).

It is expected that the higher the score on Process Alignment the greater the increase in Organisational Performance as the value of Process Improvement Competency increase. That is when Process Improvement Competency increases, the influence of Process Alignment on Organisational Performance will be much stronger. This means that a company that invests in both Process Alignment and Process

Improvement Competency will achieve a far greater level of performance than if it invests in only one. Thus, the following hypothesis is developed.

H 5 There is a positive interaction between Process Alignment and Process Improvement Competency on Organisational Performance

Similar reasoning can be applied to the interaction between Process Alignment and People Involvement. It is expected that the higher the score on Process Alignment the greater the increase in Organisational Performance as the value of People Involvement increases. This is when People Involvement increases, the influence of Process Alignment on Organisational Performance will be much stronger. This means that a company that invests in both Process Alignment and People Involvement will achieve a far greater level of performance than if it invests in only one. Thus, the following hypothesis is developed.

H 6 There is a positive interaction between Process Alignment and People Involvement on Organisational Performance

Similar reasoning also can be applied to the interaction between People Involvement and Process Improvement Competency. It is expected that the higher the score on People Involvement the greater the increase in Organisational Performance as the value of Process Improvement Competency increases. This is when Process Improvement Competency increases, the influence of People Involvement to Organisational Performance will be much stronger. This means that a company that invests in both People Involvement and Process Improvement Competency will achieve a far greater level of performance than if it invests in only one. Thus, the following hypothesis is developed.

H 7 There is a positive interaction between People Involvement and Process Improvement Competency on Organisational Performance

3.3.3 Hypothesis 8 to Hypothesis 13

There were two levels of business performance: Organisational Performance and Core Process Performance. Organisational Performance measures performance in a holistic way, according to the expectations of external stakeholders. These may include owners, investors, customers, regulators, and society. Core Process Performance is the extent to which an organisation ensures that its core processes meet customer needs and work efficiently (adapted from Rummler and Brache, 1995). Moreton and Chester (1997) noted that the performance of core processes has a direct impact on the performance of the organisation. Therefore, one would expect that factors that affect Organisational Performance will also affect Core Process Performance. Hypothesis 4 suggested that Process Management Capability is positively associated with Organisational Performance. It would be reasonable to expect that Process Management Capability (PMC) is also positively associated with Core Process Performance (CPP). This leads to the following hypotheses:

H 8 Process Management Capability is positively associated with the performance of the process for determining customer needs

H 9 Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations

H 10 Process Management Capability is positively associated with the performance of the process for designing new products and services

H 11 Process Management Capability is positively associated with the performance of the process for providing products and services to customers

H 12 Process Management Capability is positively associated with the performance of the process for billing customers

H 13 Process Management Capability is positively associated with the performance of the process for providing after-sales services

3.4 Summary

- Organisation seeking to adopt Business Process Management face three main challenges: (1) they must align the elements of their organisation with their core processes (namely Process Alignment); (2) they must involve people at all levels in process management (namely, People Involvement); and (3) they must be successful in their process improvement programs (namely, Process Improvement Competency). Process Alignment, People Involvement and Process Improvement Competency aggregate to form the construct Process Management Capability.

- In this thesis, a research model was developed to describe the relationship between Process Management Capability and business performance.

- Based on the research model, thirteen research hypotheses were derived for this thesis. The first four hypotheses examine the relationship of Process Alignment, People Involvement, Process Improvement Competency and Process Management Capability on Organisational Performance respectively. This is followed by three hypotheses that examine the interaction between (1) Process Alignment and People Involvement; (2) Process Alignment and Process Improvement Competency; and (3) People Involvement and Process Improvement Competency; each on Organisational Performance. The next six hypotheses examine the relationship between Process Management Capability and the performance of each of six core processes.

CHAPTER 4

EMPIRICAL SURVEY DESIGN

According to Babbie (1998), good research design addresses the planning of scientific inquiry – designing a strategy for finding out something. There are two major aspects of research design. First, you must specify as clearly as possible what you want to find out. Second, you must determine the best way to do it. In this chapter, six issues are addressed: research design, survey design issues, instrument development and operationalisation, survey instrument pilot testing, survey administration and data collection, measurement scales and statistical methods for data analysis.

4.1 Research Design

A research design is a plan for selecting sources and types of information, specifying the relationship among variables, and outlining the procedure from the hypotheses to the analysis of the data (Cooper and Emory, 1995). This section discusses the research design used in the thesis.

4.1.1 General Purposes of the Research

According to Babbie (1998), there are three general purposes of social scientific research: exploration, description and explanation. Much of social research is conducted to explore a topic, or to provide an initial familiarity with that topic. This exploratory approach is typical when a researcher examines a new interest or when the subject of studies is itself relatively new. In the descriptive approach, the researcher observes and then describes what was observed. The third general purpose of social scientific research is explanatory, which seeks to explain phenomenon in social science. This thesis has all three purposes: exploration, description and explanation.

According to Leedy (1993), the nature of the data dictates the methodology. Research methodologies can be classified under three approaches: quantitative, qualitative, and triangulation.

The quantitative approach analyses numerical variables and controls natural phenomena. It constructs hypotheses and tests them against observed numeric data. Of all quantitative hypotheses, the null hypothesis is perhaps the most often tested. The researcher decides what factors or variables might cause certain results (cause and effect) and carries out tests to either support or reject the null hypothesis at some level of statistical probability (Ramer, 1989).

The qualitative approach considers words as the elements of data. It is primarily an inductive approach to data analysis and emphasise theory development as an outcome of data analysis. The triangulation approach combines both quantitative and qualitative approach. Triangulation also adds case studies. This approach may add scope and breadth to a quantitative or qualitative study (Creswell, 1994).

To date, Business Process Management is still a relatively new field in the literature (Lee and Dale, 1998). There are a number of previous studies which are limited in scope and descriptive in nature (Armistead and Machin, 1997; Corrigan, 1996; DeToro and McCabe, 1997; Elzinga et al., 1995; Hinterhuber, 1995; Lee and Dale, 1998; McCormack, 1999; Prior-Smith and Perrin, 1996; Zairi, 1997). Therefore, this thesis has an element of exploration.

This thesis also observes and describes many aspects of business performance, information technology, people, and process improvement initiatives. Thus, this thesis has a descriptive element.

Furthermore, this thesis examines Business Process Management in respect of how Process Management Capability affects business performance. It also attempts to define the mechanism that describes the construct Process Management Capability. Therefore, this thesis contains an explanatory element.

4.1.2 Research Hypotheses

In this thesis, several fields of study related to Business Process Management were reviewed in Chapter 2. These are the theories of Organisational Structure, Strategic Management, Information Technology, Continuous Improvement, and Process Reengineering, Benchmarking. After examining the literature, a research model was developed. Based on the literature review and the proposed research model, thirteen hypotheses between independent variables and dependent variables are established. The research hypotheses of this thesis are shown in Table 4.1.

H 1	*Process Alignment is positively associated with Organisational Performance.*
H 2	*People Involvement is positively associated with Organisational Performance.*
H 3	*Process Improvement Competency is positively associated with Organisational Performance.*
H 4	*Process Management Capability is positively associated with Organisational Performance.*
H 5	*There is a positive interaction between Process Alignment and Process Improvement on Organisational Performance.*
H 6	*There is a positive interaction between Process Alignment and People Involvement on Organisational Performance.*
H 7	*There is a positive interaction between People Involvement and Process Improvement on Organisational Performance.*
H 8	*Process Management Capability is positively associated with the performance of the process for determining customer needs.*
H 9	*Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations.*

Table 4.1 Research hypotheses

H 10	*Process Management Capability is positively associated with the performance of the process for designing new products and services.*
H 11	*Process Management Capability is positively associated with the performance of the process for providing products and services to customers.*
H 12	*Process Management Capability is positively associated with the performance of the process for billing customers.*
H 13	*Process Management Capability is positively associated with the performance of the process for providing after-sales services.*

Table 4.1 Research hypotheses (continued)

4.1.3 Unit of Analysis

Zikmund (1997) pointed out that the unit of analysis is the level of investigation of a study. The researcher must specify whether the unit of analysis focuses on the collection of data about organisations, departments, work groups, individuals or objects. According to Judd et al. (1991), there is no single appropriate unit of analysis that should be used in all studies. The choice of unit of analysis depends on the research questions and the level to which the researcher seeks to generalise. Some studies may require more than one level of analysis to be investigated (Zikmund, 1997).

The thesis will use a two-level unit of analysis. For the variables: Organisational Performance, Process Alignment, People Involvement, Process Improvement Competency, and Process Management Capability, the appropriate unit of analysis is the organisation. For the variable, Core Process Performance, the appropriate unit of analysis is the core process.

4.1.4 The Time Dimension

This thesis involves a statistical and cross-sectional study. In a statistical study, hypotheses are tested quantitatively. A statistical study typically needs a large number of respondents. The number of respondents required depends on the statistical method used in the data analysis. A cross-sectional study is a study that is only carried out at a single point of time (Cooper and Emory, 1995). A cross-sectional study cannot show social or behavioural change over varying periods of time (Miller, 1991). A cross-sectional study was employed because social change and behavioural change over time are outside the scope of the thesis.

4.1.5 Method of Data Collection

This thesis examines (1) Process Alignment which consists of Horizontalism, IT Alignment, Strategy Alignment; (2) People Involvement which consists of Executive Commitment and Employee Empowerment; and (3) Process Improvement Competency which looks at the level of activity of Continuous Improvement, Process Reengineering and Benchmarking. Since the coverage of issues is very broad, a survey is more preferable than direct observation.

The survey method is suitable for use in this thesis because survey research has three distinct characteristics. First, it involves collection of information by asking people questions in some structured format. Second, survey research usually facilitates the use of quantitative methods to analyse the relationships between variables. Third, information is generally collected from a sample- a fraction of a population- rather than from every member of the population (Malhotra and Grover, 1998). According to Judd et al. (1991), a survey is the preferred method of data collection when independent variables cannot be manipulated in the study. This is the case for the thesis. It allows for replicability, permits some degree of statistical power, and may promote the ability to draw general conclusions to achieve a stronger theoretical foundation (Judd et al., 1991). Drawing general conclusions about Australia's Top 1000 companies is a major purpose of this thesis.

4.1.6 Validity and Reliability

Carmines and Zeller (1979) pointed out that measurement may be viewed as the process of linking abstract concepts to empirical measures. Measurement may be affected by two kinds of measurement error: random error and non-random error. Random error describes the error due to chance factors and is unsystematic. Non-random error refers to systematic bias. The lower the random and non-random errors, the better the quality of the measurement instrument. The assessment of validity will be discussed in Section 5.6.

A measurement instrument is reliable to the extent that repeated administration of the instrument to the same population will yield the same result (assuming that the population has not changed for the characteristic being measured). Broadly defined, reliability is the degree to which measures are free from error and therefore yield consistent results (Judd et al., 1991). The assessment of reliability will be discussed in Section 5.7.

4.2 Survey Design Issues

This section will address the population for the survey, key informant and response rate required.

4.2.1 Population for the Survey

The population of this survey is the Top 1000 Australia companies. One of the defining characteristics of Business Process Management is the adoption of Continuous Improvement, Process Reengineering and Benchmarking. According to the CSC Index (1994) and Smith and Willcock (1995), almost all Process Reengineering activities in North America and Europe are undertaken by large companies. Therefore, because BPM and Process Reengineering initiatives share similar concepts (for example, core processes), the population frame of this thesis is also chosen as large companies. The population frame consisted of the Top 1000 companies in Australia based on market capitalisation, as reported by MOS Data Assembly Specialists in June 1999.

This survey is therefore a census of Australia's top 1000 companies.

4.2.2 Key Informant

In research, it is very important that the data is collected from the most appropriate person in a company especially when the unit of analysis is multi-level. Huber and Power (1985) provide guidelines for selecting key informants. If only one informant per company is to be questioned, the person who is most knowledgeable about the issues of interest must be identified. For this thesis, the key informant is a person who (1) has good knowledge of the corporate plan, change initiatives, IT and core processes; (2) understands the level of participation of all members in the organisation in decision making and problem solving; (3) knows the level of competency of process improvement in organisation; and (4) is concerned with organisational performance and the performance of core processes. The most appropriate person is most likely a top executive.

In order to validate the assumption that a top executive should be the key informant in Australian companies, a preliminary opinion questionnaire was distributed. The preliminary opinion questionnaire is provided in Appendix A. The respondents and the result of the preliminary opinion questionnaire are discussed below.

A preliminary opinion questionnaire was distributed to 60 post-graduate full-time MBA, part-time MBA, and Graduate Diploma students from the Australian Graduate School of Management (Newtown Campus) during March 1999. All students had full-time working experience in Australian companies (minimum requirement was two years).

Fifty-three responses were received for the preliminary opinion questionnaire. Seventy-five percent of the respondents indicated that the Managing Director / Chief Executive Officer would be the best key informant, followed by Directors (16%). These results validate the identification of the key informant as a top executive.

In this thesis, a mail survey addressed to the Managing Director or Chief Executive Officer was used for the following three reasons: (1) the potential responding organisations were geographically dispersed; (2) as top management, the respondents are very busy people who are difficult to contact by telephone and are difficult to personally interview. A questionnaire received in the mail is much more convenient for these respondents; (3) a mail survey is perceived as providing more anonymity and confidentiality than a telephone call or personal interview.

The major weakness of a mail survey is non-response. The researcher usually knows little about how those who answer may differ from those who do not answer. Any attempt to increase the response rate should be carefully tried (Cooper and Emory, 1995; Fowler, 1993). In this thesis, the key informant was reminded by follow-up calls four days after the large-scale mail distribution, and then a follow-up fax if there was no response two weeks after the follow-up call.

4.2.3 Response Rate Required

Problems in statistical data analysis occur when the number of respondents is small. According to Hair et al. (1995), sample size has a substantial impact on detecting statistical significance in multivariate analysis. It also affects the ability to draw general conclusions from the results. As a general rule, the ratio of observations to independent variables should never fall below five. Hair et al. (1995, p 105) also pointed out that "while the minimum ratio is 5 to 1, the desired level is between 15 to 20 observations for each independent variable. When this level is reached, the results should be generalizable if the sample size is representative." The aim of this thesis was to achieve a ratio of observations to independent variables greater than 10.

In this thesis, there are three independent variables (Process Alignment, People Involvement and Process Improvement Competency) and three two-way interactions between those independent variables (interaction between Process Alignment and People Involvement; interaction between Process Alignment and Process Improvement Competency; and interaction between People Involvement and Process Improvement Competency). The total number of independent variables and their interactions is therefore equal to 6. Thus, the number of observations required to draw statistically valid conclusions is at least 10 * 6 = 60.

The number of observations depends on several factors:

(1) *Number of questionnaires sent.* In this thesis, the questionnaire was sent to all Top 1000 companies in Australia. The actual number of questionnaires sent was 950, adjusted because of mergers and acquisitions.

(2) *Percentage of companies that undertake all three types of process improvement initiatives.* The three process improvement initiatives are Continuous Improvement, Process Reengineering, and Benchmarking. The variable Process Improvement Competency and hence Process Management Capability cannot be measured unless a company has undertaken all three types of process improvement initiatives. This is a constraint on the number

of observations that can be used to test the research model. Based on previous research, the percentage of companies in America, Canada, Australia and the United Kingdom that have conducted Continuous Improvement, Process Reengineering, and Benchmarking was estimated at 70%, 65%, and 70% respectively (CSC Index, 1994; Hill and Collins, 1998; Lawler et al., 1998; O'Neill and Sohal, 1998; Teng et al., 1998; Zairi and Sinclair, 1995). The percentage of companies that undertake all three types of process improvement initiatives is likely to be 70% * 65% * 70% = 31.8%.

(3) R*esponse rate*. Higher response rates increase the number of observations.

Therefore, the minimum response rate to draw statistically valid conclusions would be: 60 / (950 * 31.8%) = 19.9%.

In the literature review, two surveys in Continuous Improvement, four surveys in Process Reengineering and three surveys in Benchmarking were identified (Lawler III et al., 1998; Ramabadran, 1996; CSC Index, 1994; Drew, 1996; Sung, 1998; Zairi & Sinclair, 1995; O'Neill and Sohal, 1998). Their response rates averaged 18%. Thus, it seemed reasonable to expect a response rate of 19.9%.

In order to achieve the best response rate, a cover letter, promise of confidentiality, attractive design of questionnaire and follow-up campaign were used. These actions will be discussed in more detail in section 4.5.

4.3 Instrument Development and Operationalisation

For each of the variables in the research model in Figure 3.1, relevant literature was searched to find appropriate scales that had been developed by other researchers. If a scale was not available in the literature, the appropriate scale was adapted from one or several related scales in the literature. Rigorous checks for the measurement scale's validity and reliability were employed in this thesis.

Process Alignment, Process Improvement Competency and People Involvement cannot be measured directly. These are measured as the aggregate of their components. The components of Process Alignment are Horizontalism, Strategy Alignment and Information Technology Alignment. The components of Process Improvement Competency are Continuous Improvement Competency, Benchmarking Competency and Process Reengineering Competency. The components of People Involvement are Executive Commitment and Employee Empowerment. The scales to measure components were adapted from one or several related scales in the literature.

The type of scale used in this questionnaire was mainly a five-category Likert scale. The major advantages of a Likert scale lie in its ability to measure a general construct and its ease of construction for a questionnaire format (Alreck and Settle, 1995; Fowler, 1993). The respondent was asked to indicate their level of agreement with a set of statements. Their level of agreement could range from strongly agree, agree, neutral, disagree, to strongly disagree. Each level of agreement was given a numerical score of five, four, three, two and one, respectively. Some scores needed to be reversed because of the negative nature of the statement. Each component consisted of five to eight item scales. In general, the score on a variable is the aggregate of the scores on each component within that variable. The score on a component is the sum of the scores on each item scales within that component (Cronbach, 1951; DeVellis, 1991; Hair et al., 1995). A Likert scale usually provides an ordinal level of measurement scale (Cramer, 1994). The measurement scale is discussed in more detail in section 4.6.1.

The questionnaire consisted of five parts. In part one, respondents were asked to indicate general information about the company. In part two, respondents were asked to indicate how well organisational structure, information technology, and strategy aligned with core processes. In part three, respondents were asked to indicate the commitment of top executive management and employee empowerment. In part four, respondents were asked to indicate the level of competency in Continuous Improvement, Process Reengineering and Benchmarking. In part five, respondents were asked to indicate the perceived level of business performance at both organisational and core processes levels. The framework for the questionnaire design is depicted in Appendix B.

The operationalisation of the components and variables, type of measurement scale, and question number in the questionnaire is depicted in Table 4.2. The definition of variables and terms used in this thesis is in Appendix C.

The complete questionnaire package consisted of a cover letter and the questionnaire. This package is provided in Appendix D. In the following section, the operationalisation of each variable is examined in more detail.

Variables / Components	Operationalisation	Type of scale and question number (see Appendix D.2)
Process Alignment		
Horizontalism	- There are high barriers between departments - We make frequent use of process teams - Our cross-functional teams have more authority than departmental managers in making day-to-day decisions - Our response time satisfies customer needs - Horizontal communication is well practiced in our organisation - We have a flat organisational structure - We delegate managerial tasks to front-line staff	Ordinal scale - Part 2 Q1.a – Q1.g
IT Alignment	- Our IT enables our business processes to perform well - Our IT is state-of-the-art - The amount of data shared by employees is increasing - Information Technology is very important to the improvement of our business processes -Our Information Technology systems are well integrated across functional units	Ordinal scale - Part 2 Q2.a – Q2.e
Strategy Alignment	- We develop strategies based on customer needs - The management team has identified our core processes - Our core processes are an important input into our strategic plan - Our operational improvements have a direct impact on our ability to compete - We have sufficient measures to permit clear tracking of our performance - Our current strategic plan identifies the projects we actually undertake to improve our business processes - Our strategic planning process encourages information sharing and cross-functional cooperation	Ordinal scale - Part 2 Q3.a – Q3.g
People Involvement		
Executive Commitment	- Top management has received adequate training in managing core processes - Top management has sufficient knowledge on how to manage core processes - Top management actively communicates to employees on how best to manage core processes - Top management expressly recognises the need to identify core processes - Top management allocates adequate resources to improve core processes	Ordinal scale - Part 3 Q1.a – Q1.e

Table 4.2 Operationalisation of variables and components

Variables Components	Operationalisation	Type of scale and question number (see Appendix D.2)
People Involvement		
Employee Empowerment	- Employees are increasing their involvement in the way their work is planned - Employees are increasing their autonomy in making decisions that affect their work - Employees *are not given* the necessary resources to fix problems they encounter - Employees are encouraged to fix problems they encounter - Employees are interacting more with external customers	Ordinal scale - Part 3 Q2.a – Q2.e
Process Improvement Competency		
Continuous Improvement Competency	- How long has your organisation been undertaking Continuous Improvement programs? - We have increased the number of employees involved in Continuous Improvement programs in the last three years - The number of Continuous Improvement projects has increased annually in the last three years - We have a formal methodology in place to guide our Continuous Improvement programs - Our organisation will definitely continue with Continuous Improvement programs - Our experience with Continuous Improvement programs has generally been positive - Our Continuous Improvement programs contribute to bottom line improvement	Ordinal scale - Part 4 section 4A Q1 & Q2.a – Q2.f
Process Reengineering Competency	- How long has your organisation been undertaking Process Reengineering programs? - We have increased the number of employees involved in Process Reengineering programs in the last three years - The number of Process Reengineering projects has increased annually in the last three years - We have a formal methodology in place to guide our Process Reengineering programs - Our organisation will definitely continue with Process Reengineering programs - Our experience with Process Reengineering programs has generally been positive - Our Process Reengineering programs contribute to bottom line improvement	Ordinal scale - Part 4 section 4B Q1 & Q2.a – Q2.f

Table 4.2 Operationalisation of variables and components (continued)

Variables Components	Operationalisation	Type of scale and question number (see Appendix D.2)
Process Improvement Competency		
Benchmarking Competency	- How long has your organisation been undertaking Benchmarking programs? - We have increased the number of employees involved in Benchmarking programs in the last three years - The number of Benchmarking projects has increased annually in the last three years - We have a formal methodology in place to guide our Benchmarking programs - Our organisation will definitely continue with Benchmarking programs - Our experience with Benchmarking programs has generally been positive - Our Benchmarking programs contribute to bottom line improvement	Ordinal scale - Part 4 section 4C Q1 & Q2.a – Q2.f
Organisational Performance	- Our organisation's competitive position has improved over the last two years - The productivity of our employees has increased over the last two years - Our organisation's profitability has increased over the last two years - The quality of our products and services *has not* improved over the last two years - Our average cost per unit of product or service has decreased over the last two years	Ordinal scale - Part 5 Q1.a – Q1.e
Core Process Performance	- The process for determining customer needs - The process for monitoring changes in customer expectations - The process for designing new products and services - The process for providing products and services to customers - The process for billing customers - The process for providing after-sales service	Ordinal Scale - Part 5 Q2

Table 4.2 Operationalisation of variables and components (continued)

4.3.1 Process Alignment

This section examines the three components of Process Alignment: Horizontalism, IT Alignment and Strategy Alignment.

Horizontalism is the term used to represent the organisational transformation – from a vertical to a horizontal structure – required to build and sustain a commitment to meeting and exceeding customer expectations (Spector, 1995). The scale to measure Horizontalism is adapted from Byrne (1993), Hammer (1996), Spector (1995) and Stewart (1992). Respondents were asked to indicate the level of Horizontalism in terms of: (1) barriers between departments; (2) use of process teams; (3) authority of cross-functional teams compared to departmental managers; (4) response time to satisfy customer needs; (5) horizontal communication; (6) flat organisational structure; and (7) delegation of managerial tasks to front-line staff. Questionnaire part 2 questions 1.a through 1.g were used to measure Horizontalism. All item scores were averaged to derive the score for Horizontalism.

IT Alignment measures the extent of the alignment of IT with the information needs of core processes. The scale to measure IT Alignment is adapted from Guimaraes and Bond (1996) and Narver and Slater (1990). Respondents were asked to rate on a five-point scale the extent to which they agreed or disagreed with statements relating to: (1) IT as an enabler to perform business processes; (2) IT is state-of-the-art; (3) the amount of data sharing by employees; (4) importance of IT in improving business processes; and (5) integration of IT across functional units. Questionnaire part 2 questions 2.a through 2.e were used to measure IT Alignment. All item scores were averaged to derive the score for IT Alignment.

Strategy Alignment measures the extent to which the strategic plan integrates related activities across functional entities and is based around core processes. The scale to measure Strategy Alignment is adapted from Byrne (1993), the Economist Intelligence Unit Limited and Andersen Consulting (1996) and MBNQA. It is measured by seven questions: (1) strategies developed based on customer needs; (2) core processes are identified by the management team; (3) core processes are an input into strategic plan; (4) impact of operational improvements on ability to compete; (5) measures to track organisational performance clearly; (6) current strategic plan identifies the projects to improve business processes; and (7) information sharing and cross-functional cooperation encouraged by strategic planning process. Questionnaire part 2 questions 3.a through 3.g were used to measure Strategy Alignment. All item scores were averaged to derive the score for Strategy Alignment.

4.3.2 People Involvement

People Involvement consists of two components: Executive Commitment and Employee Empowerment. Executive Commitment measures the extent of commitment of top executive management towards managing core processes. The scale to measure Executive Commitment is adapted from Ahire et al. (1996), Lee (1995) and Shabana (1995). Executive Commitment is measured by five items: (1) adequate training in managing core processes; (2) sufficient knowledge on how to manage core processes; (3) actively communicating to employees how to manage core processes; (4) the need to explicitly identify core processes; and (5) allocation of adequate resources to improve core processes. Questionnaire part 3 questions 1.a through 1.e were used to measure Executive Commitment. All item scores were averaged to derive the score for Executive Commitment.

Employee Empowerment measures the extent to which a company provides the authority, environment and facilities needed by employees to adequately manage business processes (Schultz et al., 1984). The scale to measure Employee Empowerment is adapted from Ahire et al. (1996) and Powell (1995). Employee Empowerment is measured by: (1) involvement of employees in the way work is planned; (2) the autonomy of employees in making decisions that affect their work; (3) employees given the necessary resources to fix problems; (4) employees are encouraged to fix problems; and (5) employee interaction with external customers. Questionnaire part 3 questions 2.a through 2.e were used to measure Employee Empowerment. All item scores were averaged to derive the score for Employee Empowerment.

4.3.3 Process Improvement Competency

Process Improvement Competency consists of three components: Continuous Improvement Competency, Process Reengineering Competency and Benchmarking Competency. Continuous Improvement represents the creation of small-step change in work processes. Continuous Improvement, in general, depends on a few fundamental factors including process assessment, process analysis and control, and process improvement. Furthermore, it includes setting, selecting, defining, standardising, tightening, improving, and assessing a process for Continuous Improvement (Hunt, 1995). Continuous Improvement Competency refers to the extent of a company's capability in successfully implementing Continuous Improvement programs (Suryo, 1999). The scale to measure Continuous Improvement Competency is adapted from Ahire et al. (1996), Anderson and Camp (1995) and Dew (1994). This scale consists of items that measure (1) the length of experience with Continuous Improvement programs; (2) increase in the number of employees involved in Continuous Improvement programs; (3) increase in the number of Continuous Improvement programs; (4) formal methodology to guide Continuous Improvement programs; (5) continuation of Continuous Improvement programs; (6) positive experience with Continuous Improvement programs; and (7) contribution of Continuous Improvement programs to bottom line improvement.. Questionnaire part 4 section 4A question 1 and 2.a through 2.e were used to measure Continuous Improvement Competency in a company. All item scores were averaged to derive the score for Continuous Improvement Competency.

Process Reengineering is defined as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed" (Hammer and Champy, 1993, p 32). Process Reengineering Competency measures the extent of the company's capability in successfully implementing Process Reengineering (Suryo, 1999). The measurement of Process Reengineering Competency is adapted from Ahire et al. (1996), Anderson and Camp (1995), Dew (1994) and Powell (1995). This scale consists of items that measure (1) the length of experience with Process Reengineering; (2) increase in the number of employees involved in Process Reengineering programs; (3) increase in the number of Process Reengineering programs; (4) formal methodology to guide Process Reengineering programs; (5) continuation of Process Reengineering programs; (6) positive experience with Process Reengineering programs; and (7) contribution of Process Reengineering programs to bottom line improvement. Questionnaire part 4 section 4B question 1 and 2.a through 2.e were used to measure the Process Reengineering Competency in a company. All item scores were averaged to derive the score for Process Reengineering Competency.

Benchmarking is the term used for a continuous and systematic improvement process based on evaluating and adapting the products, services, and processes of a company that represent best practice (adapted from Spendolini, 1992). Benchmarking Competency measures the extent of a company's ability to successfully implement Benchmarking (Suryo, 1999). The scale to measure Benchmarking Competency is adapted from Ahire et al. (1996), Anderson and Camp (1995) and Dew (1994). This scale consists of items that measure (1) the length of experience with Benchmarking; (2) increase in the number of employees involved in Benchmarking programs; (3) increase in the number of Benchmarking programs; (4) formal methodology to guide Benchmarking programs; (5) continuation of Benchmarking programs; (6) positive experience with Benchmarking programs; and (7) contribution of Benchmarking programs to bottom line improvement. Questionnaire part 4 section 4B question 1 and 2.a through 2.e were used to measure the Benchmarking Competency in a company. All item scores were averaged to derive the score for Benchmarking Competency.

4.3.4 Business Performance

This thesis defines two levels of business performance: Organisational Performance and Core Process Performance (adapted from Rummler and Brache, 1995). Questionnaire Part 5 questions 1.a through 1.e were used to measure Organisational Performance. The scale to measure Organisational Performance is adapted from Lawler et al. (1998) and Powell (1995). Respondents were asked to rate on a five point scale the extent to which they agree or disagree with statements relating to the increase or decrease of the: (1) company's competitive position; (2) productivity of employees; (3) company's profitability; (4) the quality of products and services; and (5) average cost per unit of product or service. All item scores were averaged to derive the score for Organisational Performance.

The term core processes describes those processes that are central to a company, starting with identifying opportunities, customer needs and purchase orders, through to delivering products and services to external customers. They are critical to customer satisfaction and have a high impact on the strategic goals and objectives of the company. This thesis nominates six core processes to study the process level of performance of an organisation. The names of these six core processes are adapted from the International Benchmarking Clearinghouse (1995) and Arthur Andersen (1998). They are: (1) the process for determining customer needs; (2) the process for monitoring changes in customer expectations; (3) the process for designing new products and services; (4) the process for providing products and services to customers; (5) the process for billing customers; and (6) the process for providing after-sales services.

Core Process Performance was measured by asking respondents to rate on a five-point scale for each core process whether its performance was extremely good, good, neutral, bad or extremely bad. Questionnaire Part 5 questions 2.a through 2.f were used to measure Core Process Performance.

In addition, data were collected on the position of the respondent in the company, type of industry, years of company in business, number of employees, and sales volume. These data form the responding company profile and respondent profile. In this thesis, the size of the organisation was measured by the total number of employees.

Fowler (1993) pointed out that the length of the questionnaire affects the response rate of a survey. He suggested that surveys should not take more than thirty minutes. In this questionnaire, respondents ticked from forty-nine up to eighty-two boxes. The number of ticked boxes depended on whether the responding company performed Continuous Improvement, Process Reengineering and Benchmarking. At one extreme, if the company attempted all three, the respondent ticked eighty-seven boxes and the questionnaire could be completed in twenty minutes. At the other extreme, if the company did not undertake any Continuous Improvement, Process Reengineering and Benchmarking programs, the respondent would tick fifty-four boxes and answer five open-ended questions. In this case, the questionnaire could be completed in ten minutes.

4.4 Survey Instrument Pilot Testing

Pilot testing is a preliminary trial of the effectiveness of the sampling design, survey instrumentation, and data collection method to ensure there are no unanticipated difficulties in large-scale mailing. A pilot test is also conducted to detect weaknesses in design. It also provides proxy data for selection of the sample frame (Alreck and Settle, 1995; Converse and Presser, 1986; Cooper and Emory, 1995). In this thesis, pilot testing consisted of three steps:

Step 1

Initially, six faculty members and doctoral students at the Australian Graduate School of Management (Newtown Campus), reviewed a draft of the questionnaire. They were encouraged to identify weaknesses in the instrument and to comment on the overall format of the questionnaire. Based on their comments, the questionnaire was revised to improve clarity.

Step 2

A pilot questionnaire was distributed to 90 post-graduate final year Executive MBA students from the Australian Graduate School of Management during July 1999. These students had at least four years managerial experience in Australian companies. The purposes of pilot testing were (1) to examine the adequacy of the content of the questionnaire, (2) to find the right key informant, (3) to examine the clarity of the meaning, continuity and flow of the questionnaire, (4) to check the length of time for the completion of the questionnaire, and (5) to examine the coding of the data for data analysis.

In the pilot questionnaire, respondents were asked to comment on the format and clarity of the survey instrument and to document any problems or concerns about the questionnaire. Forty-seven responses were received for the pilot questionnaire and no responses were unusable. This represented a response rate of 52%. Feedback from the pilot testing was evaluated and a final version of the questionnaire was made with minor modifications. This questionnaire was then ready for large-scale mailing.

Step 3

The data collected from the pilot test was coded and analysed using statistical software SPSS version 9.0 to find any unanticipated difficulties. Minor modification in the codebook was undertaken to improve the coding process for data analysis. Data collected during the pilot test was not used in the analysis of the large-scale mailing survey.

The final questionnaire consisted of a mixture of closed and open questions and background details of the company and respondent.

4.5 Survey Administration and Data Collection

In this thesis, the method for data collection via the mail involved transmittal of a questionnaire, accompanied by a letter of explanation and a self-addressed, prepaid envelope for returning the questionnaire. According to Babbie (1998), one important reason for not returning questionnaires is that it's perceived to be too much trouble. To overcome this problem, researchers such as Babbie (1998), Cooper and Emory (1995), Miller (1991) and Zikmund (1997) have developed several ways to increase the response rate of a mail survey. Several of their suggestions were used in this thesis.

First, a cover letter on the letterhead of the Australian Graduate School of Management was provided in the questionnaire package. The cover letter explained the purpose of the survey, the benefits to the practitioner, researcher and the advancement of knowledge. The cover letter is contained in Appendix D.1.

Second, in the cover letter, a promise was made to assure the confidentiality of the respondent data both at the individual as well as the organisational level. In addition, a summary of the survey results was offered to the respondents if they opted to receive it. According to Alreck and Settle (1995), offering a report on the results of the survey may be a powerful inducement to attract top managers and senior managers to respond.

Third, the questionnaire in this thesis was designed as a booklet with a green cover to make it more attractive. The survey questionnaire is shown in Appendix D.2. Also, a prepaid return envelope was provided in the questionnaire package in order to increase the willingness to return the questionnaire.

Fourth, a telephone follow-up campaign and a follow-up fax were used. Large-scale mailing was distributed on a Friday, and a telephone follow-up campaign was started the following Wednesday. A follow-up fax was prepared and sent at the end of four weeks after the large-scale mailing. This sequence was used to help achieve the target completion and return rate of 19.9% as mentioned in section 4.2.3.

On August 20, 1999, a total of 950 questionnaires were mailed out to the managing director or chief executive officer of Australia's Top 1000 companies, as reported by MOS Data Assembly Specialists in June 1999. The actual number of companies surveyed (950) was fewer than 1000 because of acquisitions and mergers. Each questionnaire package contained a cover letter, a questionnaire booklet, and a prepaid return envelope. The telephone follow-up campaign began on August 25, 1999.

Undeliverable questionnaire packages were recorded. When the returned questionnaires arrived, the sequence number and date received were recorded on the cover page of the questionnaire, in case a particular questionnaire needed to be examined to make corrections in the data file. Each questionnaire was sight edited to see if it was acceptable for further processing. Then the data from each questionnaire was coded based on the criteria in the codebook.

4.6 Measurement Scales and Statistical Methods for Data Analysis

The use of questionnaires usually requires statistical analysis to find relationships between variables under investigation. According to Andrews et al. (1981), Siegel (1956), and Stevens (1946), the level of measurement scale is the primary determinant for selecting the appropriate statistical techniques for analysing social science data. In the following, measurement scales and the controversy over treating ordinal scales as interval are discussed. Then, the statistical methods used in this thesis are discussed.

4.6.1 Measurement Scales

Stevens (1951, p 22) defined measurement as "rules for the assignment of numerals to aspects of objects or events". He presented a hierarchy of data scales based on invariance of their meaning under different classes of transformation. The nominal scale requires the determination of equality for placement in the classes implied. The ordinal scale requires a determination of "greater than" or "less than" for objects. The interval scale requires determination of equality of differences between scale intervals. Finally, the ratio scale requires all the qualities of the three previous scales and further requires determination of a true zero point (Stevens, 1946).

Most social science constructs are measured by ordinal rather than interval scales (Borgatta and Bohrnstedt, 1980; Judd et al., 1991). In this thesis, all components and variables are measured by ordinal scales.

Cooper and Emory (1995) describe two general types of statistical tests: parametric tests and non-parametric tests. Parametric tests are usually more powerful than non-parametric tests. To use parametric tests, the data have to meet the following assumptions: (1) The data must be independent. This means the selection of any one respondent should not affect the chance of selection of any other respondent; (2) The data should be drawn from normally distributed populations; (3) These populations should have equal variances; (4) The measurement scale should be interval or ratio.

On the other hand, non-parametric tests have fewer and less stringent assumptions. They do not require normally distributed populations and homogeneity of variance. They are useful for nominal and ordinal scales and where a small sample size is present. Non-parametric tests may be used for interval or ratio data although they waste some of the information content (Siegel, 1956).

The habit of treating ordinal scales as interval scales has been widely debated (Asher, 1983; Judd et al., 1991; Norusis, 1993; Velleman and Wilkinson, 1993). Some scholars claim that ordinal data cannot be treated as interval data (Hildebrand, 1986; Stevens, 1951; Wilson, 1971). In contrast, Bohrnstedt and Carter (1971) and Norusis (1997) disagree. They believe that the absence of interval data should not prevent a researcher from using parametric tests. A third group of scholars argues that the treatment of ordinal data as interval data should proceed with caution (Dawes and Smith, 1985; Mayer, 1970).

Since the variables and their components in this thesis are measured with ordinal scales, there exists a dilemma in whether to choose parametric or non-parametric tests.

Dawes and Smith (1985) argued that if the relationship is essentially linear, ordinal data may be treated as interval data. Borgatta and Bohrnstedt (1980) indicated that most of the constructs in social science are conceptualised to be continuous, although they are manifestly measured as discrete. If the constructs are conceptualised as continuous, the level of measurement can be treated as interval. Mayer (1970) asserts that the researcher should be cognisant of the assumptions required by the specific statistical method. Data exploration is needed before treating ordinal data as interval. This thesis follows Mayer's recommendation and performs exploratory data analysis before choosing between parametric and non-parametric statistical analysis.

4.6.2 Correlation Analysis

Correlation is concerned with the relationship between two or more variables. Correlation Analysis is aimed primarily at measuring the strength of relationship or the degree of association between variables (Harrison and Tamaschke, 1984; Wonnacot and Wonnacot, 1990).

There are two main characteristics of association: (1) whether or nor an association exists and (2) the strength and direction of the association.

(1) *Whether or not an association exists*

An association between two variables exists if the population correlation coefficient is significantly different from zero.

A significant association between two measures does not necessarily mean that the two variables are causally related. It is possible that this association is spurious because one or more variables extraneous to the two variables under consideration may be related to the two variables. It is possible that at least a third variable may intervene in the association. Conversely, the absence of a significant association between two variables does not necessarily signify no causal connection. It is possible that the relationship is suppressed or hidden by the influence of one or more other variables (Cramer, 1994). Issues of intervention and suppression are particularly important when bivariate correlation is considered in a multivariate context as is the case in this thesis. When examining the correlation between two variables, this thesis searches for the presence of other variables that may intervene or suppress their relationship.

(2) *The strength and direction of the associations*

The strength of the association is measured by the absolute value of the correlation coefficient. The larger the absolute value of the correlation coefficient, the stronger the association is. The sign of the correlation coefficient represents the direction of the association. A positive sign indicates a tendency for a high value of one variable (X) to occur with a high value of the other variable (Y), and a low value to occur with a low. A negative sign indicates a tendency for a high value of one variable to be associated with a low value of the other and vice versa. This thesis quotes the strength and direction of associations.

The Pearson product moment correlation coefficient also called Simple Correlation, measures the strength of the linear association between two variables without controlling other variables. Simple Correlation between variable X and Y (R_{xy}) can be calculated by the formula (Wonnacot and Wonnacot, 1990; Yamane, 1973):

$$R_{yx} = \frac{\sum xy}{\sqrt{\sum x^2}\sqrt{\sum y^2}}$$

Partial correlation is the correlation between two variables when other variables are controlled or held constant. The partial correlation coefficient between variable X and Y, controlling for Z ($R_{xy.z}$) can be calculated by the formula (Cohen and Cohen, 1983; Wonnacot and Wonnacot, 1990; Yamane, 1973):

$$R_{xy.z} = \frac{(R_{xy} - R_{xz} * R_{yz})}{\sqrt{(1 - R_{xz}{}^2)(1 - R_{yz}{}^2)}}$$

4.6.3 Multiple Linear Regression

Multiple Linear Regression is a statistical technique used to analyse the relationship between a single dependent variable and several independent variables. The main objective of multiple regression analysis is to predict values of the dependent variables by using known values of the independent variables. The general model for Multiple Linear Regression is (Fox, 1997; Hair et al., 1995; Mendenhall and Sincich, 1993):

$Y = b_0 + b_1 X_1 + b_2 X_2 + \ldots\ldots + b_k X_k + e$ where:

Y is the dependent variable

$X_1, X_2, \ldots\ldots X_k$ are the independent variables

b_i determines the contribution of the independent variable X_i given that the other (k-1) independent variables are held constant. b_0 is the y-intercept and e is random error term.

The following procedures should be applied in Multiple Linear Regression:

(1) Conduct a test of overall model adequacy using the F test.

(2) If there is more than one independent variable, check multicollinearity in the regression model. Multicollinearity exists when two or more independent variables are correlated (Hair et al., 1995; Stevens, 1992). Multicollinearity can be detected by calculating the Variance Inflation Factor (VIF) for each independent variable.

$VIF_i = \frac{1}{1 - R_i^2}$ where R_i^2 is the multiple coefficient of determination for the model that regresses the independent variable X_i on the remaining independent variables $X_1, \ldots, X_{i-1}, X_{i+1}, \ldots, X_k$.

Multicollinearity may result in a misleading interpretation of b_i. Under multicollinearity it is possible that b_i is not significantly different from zero although X_i actually has significant impact on the dependent variable. In extreme cases, the value of b_i may have the opposite sign to that which it should have. Multicollinearity exists if VIF is greater than 10 (Mendenhall and Sincich, 1993). If multicollinearity exists, one of the solutions is to drop one or more of the correlated independent variables from the regression model.

(3) Check the assumptions of the Multiple Linear Regression model. The error term e of the Multiple Linear Regression model must be independent, homogeneous, normally distributed with the mean equal to zero.

This thesis uses all three recommended procedures when performing Multiple Linear Regression.

According to Norusis (1993), in Multiple Linear Regression, there are three procedures for selecting variables: forward selection, backward elimination and stepwise selection. This thesis uses the backward elimination procedure when selecting variables. Backward elimination starts with all variables in the equation and sequentially removes them. Removal criteria are used in this method. Variables with F values less than F-to-remove are eligible for removal. In this thesis, the F-to-remove value is 2.71 (Norusis, 1993). Backward elimination stops when the F value in the remaining variables is less than F-to-remove.

4.6.4 The Analysis of Interaction Effects

According to Jaccard et al. (1990), there are three strategies used in the social science literature to test for interaction effects. Assume there are two independent variables X_1 and X_2 where interaction effect on Y is under investigation.

One strategy is to dichotomize X_1 and X_2 using median splits and then to conduct a traditional 2 x 2 analysis of variance using Y as the dependent variable. According to Cohen and Cohen (1983), this approach to the analysis of interaction effects is limited because: (a) dichotomizing a continuous variable discards valuable information. It essentially reduces a multi-point scale to a two-point scale; and (b) on a statistical level, dichotomization usually has adverse effects on both the percentages of variance that the dichotomized variable can account for and the statistical power.

A second strategy is to dichotomize the data according to one variable (X_2), and then to compute the slopes between X_1 and Y for each of the two resulting groups. This approach has two limitations: (1) it reduces a more precise measure of one variable to a two-point index; (2) the approach yields tests of significance that are statistically less powerful; (3) there is no intuitively interpretable index of the strength of the interaction effect.

The third strategy is to use Multiple Linear Regression and is the one used in the thesis. The regression strategy that is the most popular is that recommended by Cohen and Cohen (1983). It involves forming a multiplicative term, X_1X_2, to encompass the interaction effect.

In Multiple Linear Regression, the general regression model for one dependent variable and two independent variables is:

$$Y = b_0 + b_1 X_1 + b_2 X_2 + e$$

The above regression model implies that X_1 and X_2 have independent effects on Y, and need to be added together to predict Y. The model assumes the effect of X_1 on Y does not depend on X_2. That is, there is no interaction effect between X_1 and X_2 to Y.

Interaction occurs when X_1 increases its impact on Y as the value of X_2 increases and vice versa. The regression equation with interaction effect can be described as (McClendon, 1994; Mendenhall and Sincich, 1993):

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_1 X_2 + e$$

X_1X_2, the multiplicative term, is a new variable representing the dependency of X_1 and X_2 on Y.

b_3 is the slope that aims to measure the interaction effect.

4.6.5 Elaboration Analysis

According to Blalock (1964, 1985), there are many possible relationships between variables that can be used to provide a rationale for explaining the mechanism among variables.

To find the best predictor model, Blalock (1985) suggests the researcher should identify all possible relationships between dependent and independent variables, followed by finding the most adequate mechanism that can describe those relationships. Blalock (1985) pointed out that there are forty-one possible models to describe relationships between four variables.

This thesis explores the relationships among four variables: Organisational Performance, Process Alignment, Process Improvement Competency, and People Involvement. Organisational Performance is chosen as the dependent variable. The separation of independent and dependent variables restricts the number of possible models. Twelve possible models for three independent variables (Process Alignment, Process Improvement Competency, and People Involvement) and one dependent variable (Organisational Performance) are developed in this thesis.

Blalock (1985, p 26) also suggested that "[a researcher] can only proceed by eliminating inadequate models that give incorrect predictions, since it will ordinarily be impossible to rule out all the logical alternatives on the basis of the data at hand". This thesis follows his advice and eliminates model options until the best predictor model relating Process Alignment, Process Improvement Competency, and People Involvement to Organisational Performance is formed.

Elaboration Analysis was developed by Lazarfeld in 1972 with the aim to explain the empirical relationship between two variables in a multivariate content in order to gain more insight into the relationships (Babbie, 1998). Elaboration Analysis is a systematic way of examining the relationship of two variables by introducing one or more other variables, called control variables or test factors, into the analysis. Test factors are statistically controlled (held constant) to determine whether or not the correlation between the dependent and independent variables is due to the test factors (Babbie, 1998; Hyman, 1955; Judd et al., 1991; Rosenberg, 1968). This thesis relies heavily on Elaboration Analysis to reduce the twelve model options used to describe the mechanism of Process Alignment, Process Improvement Competency and People Involvement on Organisational Performance.

The independent variables can assume different roles in Elaboration Analysis. Rosenberg (1968) introduced six types of test factors to identify these roles. Four types of test factors are described briefly in the following (Babbie, 1998; Cooper and Emory, 1995; Rosenberg, 1968). The remaining two types are not relevant to the thesis.

(1) *Intervening variables*

An intervening variable is defined as a consequence of the independent variable and a determinant of the dependent variable. The relationship between two variables is direct when there is no intervening variable between them. The relationship between two variables is indirect when there is an intervening variable between them. An intervening variable logically follows an independent variable and is prior to a dependent variable. If an intervening variable is controlled, no relationship will be detected between the independent and dependent variable. This thesis tests for the presence of intervening variables throughout data analysis.

(2) *Suppressor variable*

A suppressor variable is a variable that intercedes to cancel out, reduce or conceal a true relationship between two variables. The absence of a relationship between two variables in a multivariate context may be misleading because the absence of the relationship may be due to the intrusion of a suppressor variable. In order to determine whether the absence of a relationship is fact, it is necessary to control any variable that is likely to be a suppressor. If non-correlation persists even after all of the likely suppressor variables are controlled, the researcher can be more confident that no correlation exists. This thesis tests for the presence of suppressor variables throughout data analysis.

(3) *Antecedent variable*

An antecedent variable is one that comes before the independent variable in the causal sequence. An antecedent variable does not explain the relationship between independent and dependent variables but clarifies the influence that precedes the relationship. When an antecedent variable is controlled, the relationship between the dependent and independent variable should remain statistically significant. When the independent variable is controlled, the relationship between the antecedent variable and the dependent variable should not be detectable. This thesis tests for the presence of antecedent variables throughout data analysis.

(4) *Extraneous variables*

Researchers want to know whether there is a meaningful link between a dependent and independent variable or whether it is based on an accidental connection with some other associated but extraneous variables. The relationship is spurious if there is no meaningful or real relationship between the two variables. A spurious relationship is caused by an accidental association of each variable with some other extraneous variables. Statistically, the relationship is spurious if the partial correlation coefficient between the two variables (when extraneous variables are controlled) is not statistically significant. This thesis tests for the presence of extraneous variables throughout data analysis.

4.7 Summary

- This thesis uses the survey method, a cross sectional study and a two-level unit of analysis.
- The population for the survey is all the Top 1000 companies in Australia based on market capitalisation. The key informant of the survey is the Managing Director or Chief Executive Officer. A minimum response rate of 19.9% was estimated prior to mailing.
- Relevant literature was searched to find appropriate scales that had been developed by other researchers. Rigorous checks for the measurement scale's validity and reliability were employed in this thesis.
- A pilot test was conducted to detect weakness in questionnaire design and to ensure that there were no unanticipated difficulties in large-scale mailing.
- To increase the response rate in large-scale mailing, a reference letter, inducement, promise of anonymity and confidentiality and prepaid return envelope, were included in the questionnaire package. A telephone follow-up campaign and a follow-up fax were used to increase the response rate.
- Appropriate statistical methods for data analysis were introduced.

CHAPTER 5

PRELIMINARY DATA ANALYSIS

This chapter describes the statistical procedures used to analyse the collected data. The chapter begins with the response profile and compares it with previous surveys in Business Process Management and related fields. This is followed by analysis of non-response bias. The profile of responding companies, the profile of respondents, and the profile of process improvement programs is then presented. Comparisons with the results of previous surveys are examined. Assessment of the validity and reliability of the measurement instrument are rigorously tested. Finally, descriptive statistics are presented on the responses of Australia's Top 1000 companies.

5.1 Response Profile

A total of 333 questionnaires were received from the 950 questionnaires distributed. Seventy-three questionnaires were discarded. This comprised sixty-two questionnaires that were returned unfilled, ten that were incomplete, and one that was undeliverable. A total of 260 questionnaires were usable, which represents a response rate of 27.4%. The response profile is shown Table 5.1.

Response profile	
Number of questionnaires sent	950
Number of questionnaires undeliverable	1
Number of questionnaires received	333
Number of questionnaires returned unfilled	63
Number of questionnaires incomplete	10
Number of usable questionnaires	260
Response rate	27.4%

Table 5.1 Response profile

Previous surveys in Business Process Management and the related fields of Total Quality Management, Reengineering and Benchmarking yielded response rates of between 9% and 28%. The response rate for this thesis and response rate of related surveys are shown in Table 5.2. The response rate of 27.4% was well above the minimum required response rate for this thesis in section 4.2.3 (19.9%).

Researcher	Main area of research	Geographical area	Key respondent	Response rate (%)
1. Lawler III et al., 1993	TQM	North America	Senior Manager	28.0%
2. Lawler III et al., 1996	TQM	North America	Senior Manager	22.0%
3. Ramabadran, 1996	Benchmarking	US & Canada	Quality Manager	n.a.
4. Drew, 1997	Benchmarking	US	n.d.	13.2%
5. Sung, 1998	Benchmarking	US	Manager	12.8%
6. CSC Index, 1994	Process ReE	US	Senior Executive	9.0%
7. Zairi & Sinclair, 1995	Process ReE	UK	Manager	13.0%
8. Drew, 1996	Process ReE	North America	Senior Executives	14.0%
9. O'Neill & Sohal, 1998	Process ReE	Australia	Senior Manager	19.0%
10. Hung, this thesis	BPM	Australia	Top Executive	27.4%

Note:
n.a. = Not applicable   TQM = Total Quality Management
n.d. = No data   ReE = Reengineering
BPM = Business Process Management

Table 5.2 Response rate of surveys in Business Process Management

In this thesis, the response rate of 27.4% is considered excellent particularly given the key informant was the MD/CEO and compares favourably to related studies conducted in Australia or overseas.

Sixty-three of the questionnaires were returned unfilled, forty of which (63.5%) gave reasons why. These reasons are categorised and tabulated in Table 5.3. The two major reasons were company policy and person targeted no longer with the company.

Reason for questionnaire return unfilled		Number of Responses
1	Company policy not to answer	18
2	Target person no longer with the company	13
3	Wrong timing	6
4	Other	3
	Total	40

Table 5.3 Reason for questionnaire return unfilled

Ten questionnaires were deemed incomplete and unusable: (1) three respondents completed less than 40% of the questions; (2) seven completed less than 90%.

This resulted in 260 analysable questionnaires. Several missing values were found in the questionnaire in the following fields: position of respondent, number of years in business, number of employees, sales volume in 1998, and whether they conducted process improvement programs. According to Hair et al. (1995), missing data may result from: (1) data entry errors, and (2) the respondent refuses to answer. The small amount of missing data was not a cause for concern.

5.2 Non-Response Bias

Non-response bias is a problematical and important source of error in surveys. According to Alreck and Settle (1995), non-response bias has a systematic effect on the data, which reduces its validity. It occurs when those who respond to a questionnaire have a different opinion to those who do not. When non-response bias is very high, the effects on the reliability of mail surveys can be quite severe. It is very important to ensure that the effect of non-response bias is minimal.

In survey methods conducted via mailing, the effects of non-response bias on the data are usually not known because of the difficulties of knowing the characteristics of non-respondents. One possible way to overcome this limitation and evaluate non-response bias is to compare those who respond early with those who respond late (Fowler, 1993).

The test for non-response bias in this thesis is tabulated in Table 5.4. "Early" was defined as having responded with the first 12 days (Aug 20, 1999 – Aug 31, 1999) and "late" was defined as having responded after Aug 31, 1999 and before the close-off day at Sep 15, 1999.

For categorical/nominal variables, a Chi square test was performed. For interval/ordinal variables, the t test was performed. The null hypothesis of this analysis is that an early respondent has the same characteristics as a late respondent. The observed significant level p for all variables is much higher than 0.05. This implies that early respondents have the same characteristics as late respondents. This thesis concludes that the extent of non-response bias is insignificant, and the results are generalisable to the target population of the Top 1000 Australian companies by market capitalisation.

Non-response bias

a. Crosstabs - Chi Square test	Chi square	df	p	Conclusion
1 Position of Respondent	1.933	3	0.586	No different
2 Type of Industry	13.306	16	0.650	No different
3 Conduct the Balanced Scorecard	0.293	1	0.588	No different
4 Practice Continuous Improvement Program	0.024	1	0.878	No different
5 Practice Reengineering Program	1.832	1	0.176	No different
6 Practice Benchmarking Program	0.022	1	0.882	No different
7 Research Finding Requested by Respondent	0.557	1	0.455	No different

b. T test	Levene's test for Equality of variances					
	F test	P	t	df	P	Conclusion
*1 Size of Organisation	5.191	0.024	-1.308	250.4	0.193	No different
2 Sales Volume	0.541	0.463	-0.607	235	0.545	No different
3 Horizontalism	0.359	0.549	-1.585	249	0.114	No different
4 IT Alignment	0.455	0.501	-0.158	258	0.874	No different
5 Strategy Alignment	0.689	0.788	0.843	258	0.698	No different
6 Executive Commitment	0.979	0.323	0.840	258	0.402	No different
7 Employee Empowerment	0.066	0.798	-0.243	253	0.808	No different
8 **CI Competency	0.034	0.853	0.500	203	0.618	No different
9 **ReE Competency	0.441	0.508	0.858	178	0.559	No different
10 **BM Competency	1.168	0.281	-0.533	196	0.595	No different

Note:
* : For size, t value is calculated based on unequal variance; all other items based on equal variance
** : Continuous Improvement = CI; Process Reengineering = ReE; Benchmarking = BM

Table 5.4 Analysis of non-response bias

5.3 Responding Company Profile

In this section, six aspects of the surveyed companies are discussed. These are type of industry, years in business, total number of employees, annual sales volume, the use of outsourcing, and implementation of the Balanced Scorecard.

5.3.1 Type of Industry

Figure 5.1 shows the survey respondents classified by industry sector. Responding companies came from a wide range of industries. Almost 33% of responding companies were banks, financial, and insurance services, retail and wholesaling. Just over 15% of responding companies comprised energy and utility industries, mining and metals industries, and petrol, coal and chemical products. The remaining companies were very diversified.

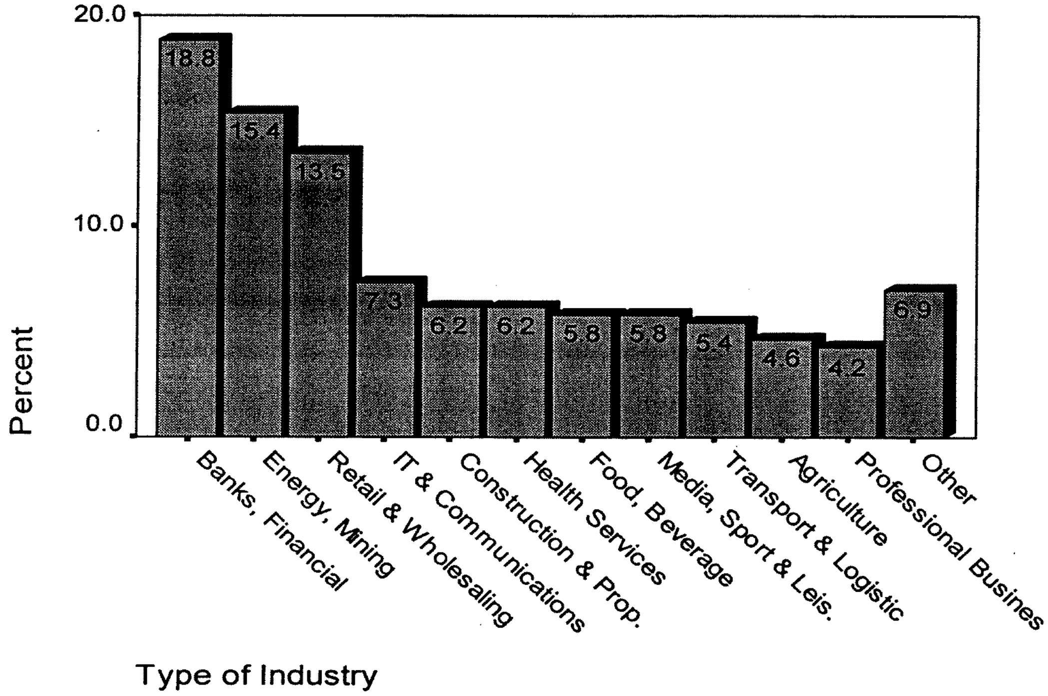


Figure 5.1 Type of industry for the responding companies

5.3.2 Years in Business

In this thesis, the questionnaire was mailed out to Australia's Top 1000 companies, as reported by MOS Data Assembly Specialists (June 1999). The actual number of companies surveyed (950) was fewer than 1000 because of acquisition and mergers. Figure 5.2 shows the distribution of the responding companies by years in business. From the resulting 260 analysable questionnaires, around 10% of the responding companies were established within the last five years. Largest percentage of companies has been in business between 16-45 years (34.2%). Almost 13% had been in business for more than 100 years.

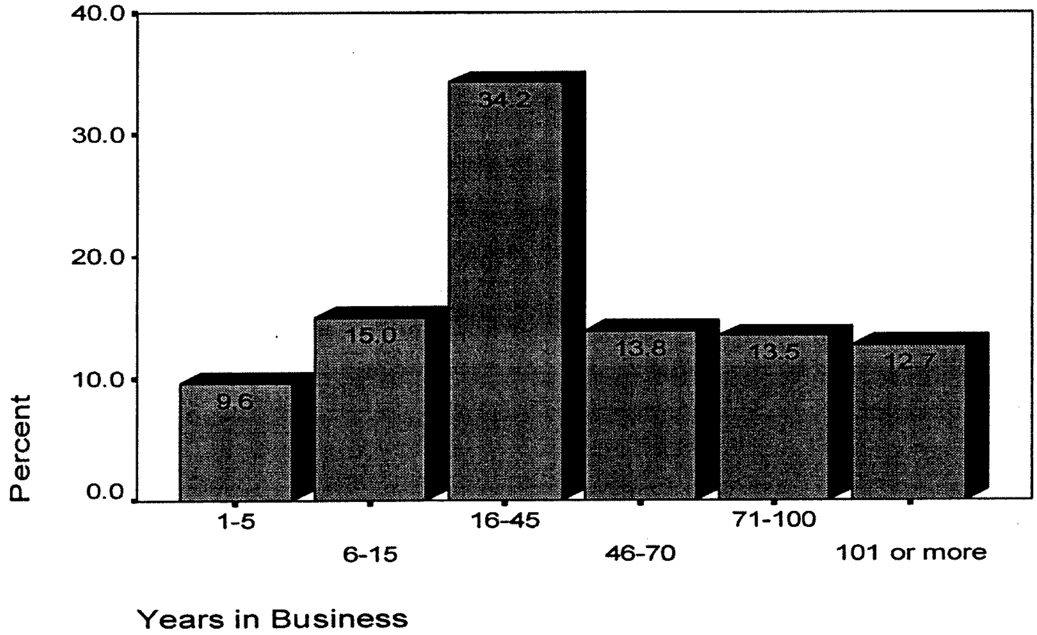


Figure 5.2 Years in business for the responding companies

5.3.3 Total Number of Employees

Figure 5.3 shows the distribution of the total number of employees in the responding companies. Thirty-five percent of companies had less than 500 employees and nearly six percent had more than or equal to 10000 employees. The number of employees is usually a good proxy indicator for the size of an organisation. Thus, in this thesis, the size of the organisation is measured as the number of employees. No distinction was made between part-time and full time employees.

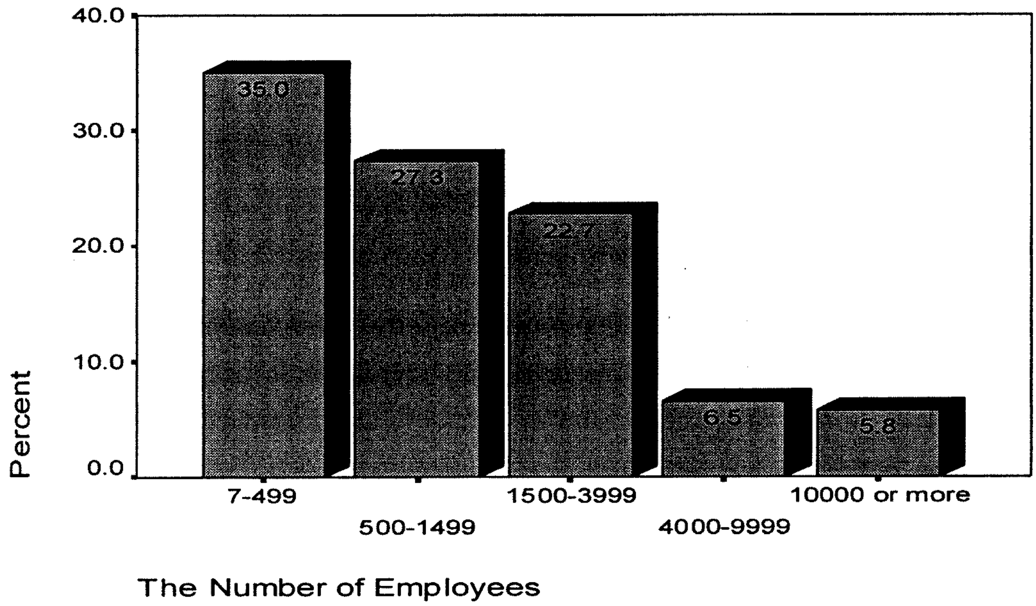


Figure 5.3 The number of employees in the responding companies

5.3.4 Annual Sales Volume

The questionnaire asked respondents for their annual sales volume in 1998. Figure 5.4 shows the distribution of the responding companies by annual sales revenue. Responding companies varied widely in annual sales. Almost 18% of companies had annual sales more than or equal to 1000 million AUD dollars. Around 3% of companies had annual sales less than 50 million AUD dollars. The average annual sales volume for the responding companies is 382.7 million AUD dollars. Twenty-three companies (representing 8.9% of the 260 responding companies) had left the annual sales volume question blank. The amount of missing data in the demographic section was the largest for annual sales. This was probably due to the perceived confidentiality of the data.

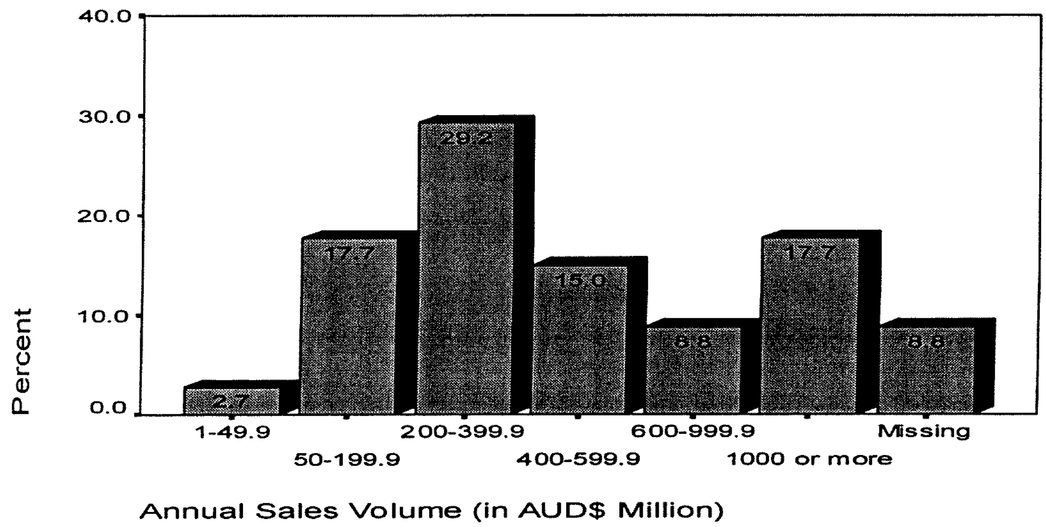


Figure 5.4 Annual sales volume for the responding companies

5.3.5 The Use of Outsourcing

Table 5.5 provides the distribution of the companies conducting or not conducting Outsourcing and which areas are outsourced. More than 83% of the responding companies had conducted Outsourcing. IT, market research, and advertising were the most popular areas. For those companies that did not conduct Outsourcing, over 51% of them intended to do so in the next two years.

Outsourcing	# of Co	Area of Outsourcing	# of Co	*Percent	Percentage
Conduct Outsourcing	217				83.5%
		IT	114	52.5%	
		Market Research	106	48.9%	
		Advertising	100	46.1%	
		Human Resource	51	23.5%	
		Warehousing	45	20.7%	
		Production	30	13.8%	
		Procurement	22	10.1%	
		Finance/Accounting	22	10.1%	
		Call Centre	16	7.4%	
		Other	52	24.0%	
Do not conduct Outsourcing	41				15.7%
		Intend to conduct	21	**51.2%	
		No intent to conduct	18	**43.9%	
Missing data	2				0.8%
Total	260				100%

Note:
* : percentages are calculated based on 217 companies
** : percentages are calculated based on 41 companies

Table 5.5 The use of Outsourcing in the responding companies

5.3.6 The Implementation of the Balanced Scorecard

Table 5.6 shows the distribution of companies which had implemented the Balanced Scorecard. Almost 37% of responding companies did not know what a Balanced Scorecard was. For the companies which did know about the Balanced Scorecard, nearly 69% had implemented it or were willing to do so in the next two years.

Balanced Scorecard	# of Co				Percentage
			# of Co	*Percent	
Conduct BSC	78				30.0%
Do not conduct BSC	87				33.5%
		Intend to do	35	40.2%	
		No intent to do	52	59.8%	
Does not know what a BSC is	95				36.5%
Total	260				100%

Note:
* : percentages are calculated based on 87 companies

Table 5.6 The implementation of the Balanced Scorecard in the responding companies

Table 5.7 shows the distribution of companies who felt that the implementation of the Balanced Scorecard improved organisational performance. Within the seventy-eight responding companies that implemented the Balanced Scorecard, twenty-nine responded that it was still too soon to tell whether the Balanced Scorecard would improve the performance of their companies. Thirty-six out of the remaining forty-nine companies (73.5%) described a moderate to major improvement in performance after implementing the Balanced Scorecard.

Balanced Scorecard vs. Organisational Performance		
	Number of companies	Percentage
Too soon to tell	29	37.2%
None	3	3.8%
Little	10	12.8%
Moderate	24	30.8%
Major	12	15.4%
Total	78	100%

Table 5.7 The impact of the implementation of the Balanced Scorecard on the improvement of organisational performance

5.4 Respondent Profile

Two characteristics of respondents are described in this section: position of respondent in the company and the respondent's request for a summary of research findings.

5.4.1 Position of Respondent in Company

Almost 99% of the respondents listed their position in the company. The distribution of the respondent positions is depicted in Table 5.8. Respondents represented a broad range of positions, with top executives comprising the majority (80.0%). Top executives were further divided into two sub-groups: (1) MD/CEO, which includes managing director, chief executive officer, and chairman; (2) Other executives, which includes chief financial officer, chief information officer, director of human resources, director of corporate planning, general manager, and other directors. The next largest percentages of respondents were managers from functional areas: strategic development, human resources, business service and quality. The remaining respondents occupied specialist positions. These were corporate strategic development adviser, secretary general, corporate policy and planning adviser, and financial controller.

The questionnaire was sent direct to the MD or CEO of each company. Middle managers and specialists who participated in this survey would have done so at the request of their MD or CEO.

The preliminary opinion questionnaire step of the thesis identified the ideal key informant as top executives (section 4.2.2). The actual respondent coincided well with the ideal key informant. This validated the preliminary opinion questionnaire results that top executives are in the most favourable position to understand wide-ranging questions on Business Process Management and business performance.

Position in company	Number of Co	# of Co	Percent	Percentage
Top executives	208			80.0%
MD/CEO		141	*54.2%	
Other executives		67	*25.8%	
Middle managers	28			10.8%
Specialists	21			8.1%
Miss Data	3			1.2%
Total	260			100%

Note:
* : percentages are calculated based on 260 companies

Table 5.8 Position of respondents from the responding companies

5.4.2 Request for Summary of Research Findings

Table 5.9 shows the distribution of whether the respondents would like to receive a summary of the research findings. Of the 260 respondents, 120 asked for a summary of the survey results of which 96 came from the Top executives. The explanation for this may be that senior executives are genuinely interested in how different approaches to process management may affect their organisation's performance.

Summary of respondents requesting the research findings			Percentage
	Number of respondents	Percent	
Yes	120		46.2%
Top executives		80.0%	
Middle managers		11.7%	
Specialist		8.3%	
No	140		53.9%
Top executives		70.0%	
Middle managers		15.0%	
Specialist		12.9%	
Total	260		100%

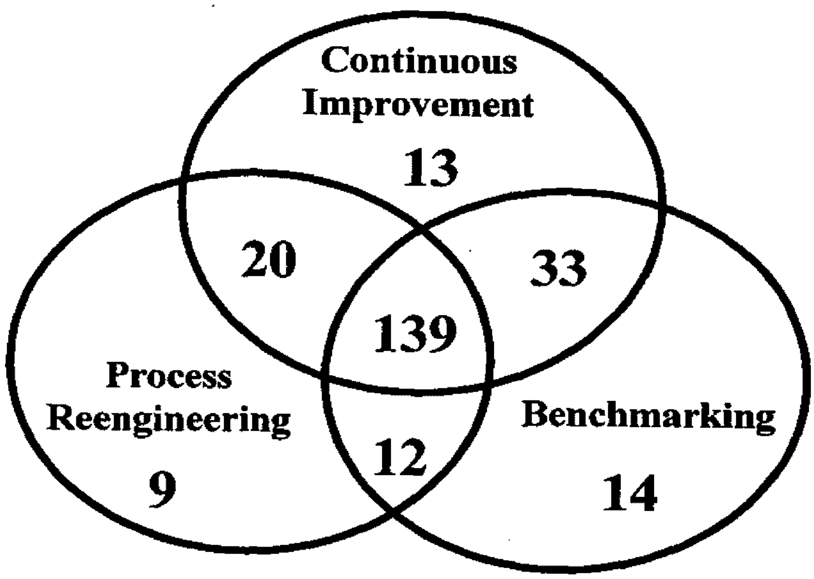
Table 5.9 Summary of respondents requesting research findings

5.5 Process Improvement Profile

Two aspects of the Process Improvement profile are discussed in this section. These are type of process improvement activities conducted by company and by industry.

5.5.1 Process Improvement Activities Conducted

The detail of process improvement activities of the responding companies is shown in the Venn diagram in Figure 5.5. The number in the Venn diagram represents the number of companies performing each process improvement initiative.



No process improvement initiative = 20
Total responding organisations = 260

Figure 5.5 Process Improvement activities

Of the 260 analysable questionnaires, 78.9% had practised Continuous Improvement (205 companies), 69.2% had practised Process Reengineering (180 companies), and 76.2% of companies had practised Benchmarking (198 companies). Almost fifty-four percent of companies had performed both Continuous Improvement, Process Reengineering and Benchmarking (139 companies), 92.3% of companies had performed at least one process improvement initiative (240 companies), and 7.7% did not conduct any process improvement initiative (20 companies).

According to Zairi and Sinclair (1995), 75% of European companies have attempted Continuous Improvement. Lawler et al. (1998) pointed out that 63% of large US companies had conducted Continuous Improvement. Hill and Collins (1998) found that 57.7% of Northern Ireland's top 100 companies had undertaken Continuous Improvement. Suryo (1999) pointed out that 81% of large Indonesian companies had conducted Continuous Improvement. Thus, the percentage of large Australian companies that had practiced Continuous Improvement was slightly lower than in Indonesia and higher than in Europe and the US.

O'Neill and Sohal (1998) found that 58% of the Top 500 Australian companies had conducted Process Reengineering. This thesis found 69% of the Top 1000 Australian companies had conducted Process Reengineering. This suggests a growth in the number of large Australian companies undertaking Process Reengineering. Australia's adoption of Process Reengineering is on a par with the rest of the world. CSC Index (1994) found that 69% of large US companies and 75% of European companies had undertaken Process Reengineering. Hill and Collins (1998) pointed out that 61% of Northern Ireland's top 100 companies had attempted Process Reengineering. Teng et al. (1998) indicated that 70% of US companies had conducted Process Reengineering. Suryo (1999) indicated that 65.6% of Indonesian companies had conducted Process Reengineering.

5.5.2 Process Improvement Activities by Industry

Table 5.10 presents the percentage of companies that have conducted process improvement initiatives by industry. The companies are categorised into three groups based on the percentage of the companies that have performed each process improvement initiative. The Health Services industry has the largest percentage across all process improvement initiatives. Media, Sport and Leisure industries score low across all process improvement initiatives.

Type of industry	No of Co.	Percentage of company has conducted* Continuous Improvement	Process Reengineering	Benchmarking
Banks, Financial & Insurance Services	49	83.7%	77.6%	69.4%
Energy , Mining & Petrol	40	85.0%	70.0%	85.0%
Retail & Wholesaling	35	68.6%	62.9%	68.6%
IT & Communications	19	89.5%	82.2%	89.5%
Construction & Property Services	16	81.3%	50.0%	81.3%
Health Services	16	100.0%	82.3%	93.8%
Food, Beverage & Tobacco	15	80.0%	66.7%	66.7%
Media, Sport & Leisure	15	53.3%	53.3%	66.7%
Transport & Logistics	14	71.4%	64.3%	85.7%
Agriculture	12	66.7%	75.0%	75.0%
Professional Business Services	11	81.8%	63.6%	81.8%
Other	18	72.2%	66.7%	66.7%

Note: * : percentage is calculated over number of companies in each industry

Table 5.10 Process improvement initiatives by industry

5.6 Assessment of Validity

Validity of a measurement instrument is the degree to which it measures the underlying construct, reflects true differences among respondents, and is free from systematic bias. Systematic bias may arise from the poor design of the instrument itself, an unsuitable respondent or unfavourable environment in which the instrument is being administered. According to Cooper and Emory (1995), there are two major forms of validity: external validity and internal validity.

5.6.1 External Validity

External validity is the ability to generalise a particular finding across different measures, settings, and populations (Mitchell, 1985; Cook and Campbell, 1979). This thesis did not seek external validity of the instrument. External validity was outside the scope of the research, which targeted only the Top 1000 Australia Companies.

5.6.2 Internal Validity

Internal validity is the ability of the measuring instrument to measure what it intends to measure (Zikmund, 1997; Carmines and Zeller, 1979). It can be divided into content validity and construct validity.

5.6.2.1 Content Validity

A measurement instrument is valid in content if it contains a representative sample from the construct's domain. Content validity refers to the representativeness or sampling adequacy of the measuring instrument (Kerlinger, 1986). If an instrument is content valid, the instrument is more expressive of the true score of an underlying construct (Pedhazur and Schmelkin, 1991). According to Cooper and Emory (1995), support of content validity is generally approached in three ways: theoretical basis for the development of the item, operationalisation from a measurement scale that has been widely adopted, and use of a panel of specialists to judge how well the instrument provides adequate coverage (Cooper and Emory, 1995; Nunnally, 1978). All three ways were adopted in this thesis.

Three steps were taken to ensure reasonable content validity. First, item scales used were drawn from the most appropriate literature. Second, when the measurement items did not exist in previous studies, this thesis developed measurement scales by drawing upon related concepts. Therefore, the content validity of the questionnaire is claimed on theoretical grounds. Third, after generating a pool of items for each variable, item scales were carefully examined based on feedback from researchers and practitioners. Six faculty members and doctoral students at the Australian Graduate School of Management, a school of both The University of Sydney and The University of New South Wales, reviewed several versions of the instrument before an initial draft was developed. The draft was then subjected to a pilot test before it was used for data collection.

5.6.2.2 Construct Validity

Construct validity refers to the ability of a measure to confirm existing knowledge (Zikmund, 1997). Construct validity of an instrument ensures that it measures the underlying construct and is not an artifact of the data collection process. Construct validity is applied only to multi-item measures, which are the type used in this thesis.

Evidence of construct validity is present when the pattern of correlation among variables conforms to what is predicted by theory (Cronbach, 1970; Kerlinger, 1986). Conformance is tested through confirmatory factor analysis (Kerlinger, 1986; Nunnally, 1978). There are two types of construct validity: discriminant validity and convergent validity. If a measurement instrument is valid then a low correlation can be expected between measures of constructs that are known to differ (discriminant validity) and a high correlation can be expected between measures of the same construct (convergent validity) (DeVellis, 1991; Judd et al., 1991).

(1) Discriminant validity

Discriminant validity refers to the distinctiveness of constructs, demonstrated by the divergence of ways researchers can measure different constructs (Pedhazur and Schmelkin, 1991). To support discriminant validity, it is necessary that a measure should have low correlation with other measures from which it theoretically differs. Scales that are highly correlated may be measuring the same construct rather than different constructs (Judd et al., 1991; Zikmund, 1997). Discriminant validity is often assessed using factor analysis.

Factor analysis refers to a variety of statistical techniques, such as principle component analysis and structural equation modeling. Principle component analysis is used as a means of exploring the data for possible data reduction. Structural equation modeling is more appropriate when confirming a certain hypothesis (Kerlinger, 1986; Kim and Mueller, 1978). In this thesis, principle component analysis was employed to explore the data for possible data reduction. Discriminant validity was evaluated by subjecting all items measuring each construct to principal component analysis to determine if the items loaded sufficiently on their constructs.

In this thesis, principal component factor analysis using varimax rotation was conducted. To determine the numbers of factors, an eigenvalue greater than one was employed. While a minimum loading of 0.30 has been regarded as sufficient, a loading factor greater than 0.40 is desirable for an item to be considered as part of a factor (Churchill, 1979; Hair et al., 1995; Kim and Mueller, 1978).

In this thesis, the items in each factor were examined using the statistical software SPSS version 9.0. Items with loading factors less than 0.40 were dropped from the construct. Items in the same factor with loading factor greater than 0.40 were grouped together. Therefore, an item may move from its original factor to a new factor if the item's factor loading in the original factor was less than 0.40 and the item's loading for the new factor was greater than 0.40. Table 5.11 shows the results of factor analysis with varimax rotation.

Items		Item's loading
Process Alignment (PALI)		
Horizontalism		
Part 2 Q1.a	There are high barriers between departments (reversed)	0.686
Part 2 Q1.b	We make frequent use of process teams	0.410
Part 2 Q1.c	Our cross-functional teams have more authority than departmental managers in making day-to-day decisions	0.838
Part 2 Q1.e	Horizontal communication is well practiced in our organisation	0.535
Part 2 Q1.f	We have a flat organisational structure	0.640
IT Alignment (consists of 2 factors)		
IT Competency (Factor 1)		
Part 2 Q2.a	Our IT enables our business processes to perform well	0.769
Part 2 Q2.b	Our IT is state-of-the-art	0.833
IT Integration (Factor 2)		
Part 2 Q2.c	The amount of data shared by employees is increasing	0.480
Part 2 Q2.d	Information Technology is very important to the improvement of our business processes	0.651
Part 2 Q2.e	Our Information Technology systems are well integrated across functional units	0.754

Table 5.11 Factor analysis with varimax rotation

Items		Item's loading
Strategy Alignment		
Part 2 Q3.b	The management team has identified our core processes	0.621
Part 2 Q3.c	Our core processes are an important input into our strategic plan	0.556
Part 2 Q3.d	Our operational improvements have a direct impact on our ability to compete	0.774
Part 2 Q3.e	We have sufficient measures to permit clear tracking of our performance	0.457
Part 2 Q3.f	Our current strategic plan identifies the projects we actually undertake to improve our business processes	0.452
Part 2 Q3.g	Our strategic planning process encourages information sharing and cross-functional cooperation	0.473
People Involvement (PINV)		
Executive Commitment		
Part 3 Q1.a	Top management has received adequate training in managing core processes	0.767
Part 3 Q1.b	Top management has sufficient knowledge on how to manage core processes	0.769
Part 3 Q1.c	Top management actively communicates to employees on how best to manage core processes	0.680
Part 3 Q1.d	Top management expressly recognizes the need to identify core processes	0.735
Part 3 Q1.e	Top management allocates adequate resources to improve core processes	0.654
Employee Empowerment		
Part 2 Q1.g	We delegate managerial tasks to front-line staff	0.660
Part 3 Q2.a	Employees are increasing their involvement in the way their work is planned	0.807
Part 3 Q2.b	Employees are increasing their autonomy in making decisions that affect their work	0.784
Part 3 Q2.d	Employees are encouraged to fix problems they encounter	0.514
Part 3 Q2.e	Employees are interacting more with external customers	0.474
Organisational Performance		
Part 5 Q1.a	Our organisation's competitive position has improved over the last two years	0.808
Part 5 Q1.b	The productivity of our employees has increased over the last two years	0.731
Part 5 Q1.c	Our organisation's profitability has increased over the last two years	0.766
Part 5 Q1.d (reversed)	The quality of our products and services has not improved over the last two years	0.463
Part 5 Q1.e	Our average cost per unit of product or service has decreased over the last two years	0.443

Table 5.11 Factor analysis with varimax rotation (continued)

Horizontalism

From the result of factor analysis, two changes were made: (a) due to a small loading factor, one item was dropped from Horizontalism (Part2 Q1.d - response time satisfies customer needs - loading factor = 0.185); (b) a second item (Part2 Q1.g - delegation of managerial tasks to front-line staff) moved to another factor, Employee Empowerment (factor loading in Horizontalism = 0.138, factor loading in Employee Empowerment = 0.660). Horizontalism thus consisted of five items. These were high barriers between departments, frequent use of process teams, more authority in cross-functional teams, well-practiced horizontal communication, and flat organisational structure.

IT Alignment

IT Alignment consisted of two factors which were interpreted as IT Competency and IT Integration. The first factor, IT Competency, contained two items: IT is an enabler of business processes performance, and IT is state-of-the-art. The second factor, IT Integration, contained three items: increase of data sharing by employees, importance of IT in business process improvement, and well integrated IT systems across functional units.

Strategy Alignment

From the results of factor analysis, one change was made. Due to a small factor loading, one item was dropped from Strategy Alignment (Part2 Q3.a – strategies development based on customer needs - loading factor = 0.223). Strategy Alignment thus contained six items: the management team has identified core processes, core processes are an important input into strategic plan, operational improvements have a direct impact on ability to compete, sufficient measures to permit clear tracking of organisational performance, current strategic plan identifies the projects to improve business processes, and strategic planning process encourages information sharing and cross-functional cooperation.

Executive Commitment and Employee Empowerment

No changes were made to Executive Commitment as a result of factor analysis. Executive Commitment consisted of five items: top management has received adequate training in managing core processes, top management has sufficient knowledge on how to manage core processes, top management actively communicates to employees, top management expressly recognises the need to identify core processes, and top management allocates adequate resources to improve core processes.

A result of factor analysis, two changes were made to Employee Empowerment: (1) due to the small loading factor, one item was dropped from Employee Empowerment (Part3 Q2.c – employees are not given the necessary resources to fix problems they encounter - loading factor = 0.166); (2) as discussed in point (b) of Horizontalism, one item (Part2 Q1.g = delegation of managerial tasks to front-line staff) was moved to Employee Empowerment. Thus Employee Empowerment consisted of five items: delegation of managerial tasks to front-line staff, increase of employee involvement in planing their work, employees are increasing their autonomy in making decisions that affect their work, employees are encouraged to fix problems they encounter, and employees are interacting more with external customers.

Organisational Performance

From the results of factor analysis, Organisational Performance contained five items: company's competitive position has improved over the last two years, the productivity of employees has increased over the last two years, company's profitability has increased over the last two years, the quality of products and services *has not* improved over the last two years, and average cost per unit of product or service has decreased over the last two years.

As shown in Table 5.11, the results of the factor analysis suggest that the factor structure of the questionnaire is stable and provides strong evidence for the discriminant validity of the measurement instrument.

(2) Convergent validity

Convergent validity refers to the extent to which a measure is correlated or agrees with other measures in the same construct (Stone, 1978). Evidence of convergent validity is provided by significant correlation between total scores and item scores (Kerlinger, 1986). Each item score is subtracted from the total score and this resulting new total score is then correlated with the item score. Correlation between total score and item score was calculated using the statistical software SPSS version 9.0. Table 5.12 presents the result of item and total score correlation. All correlations were significant with observed significant level of p less than 0.05. These results support convergent validity of the measurement instrument.

Scale Items		Item-total correlation
Process Alignment (PALI)		
Horizontalism		
Part 2 Q1.a	There are high barriers between departments (reversed)	0.5426*
Part 2 Q1.b	We make frequent use of process teams	0.4967*
Part 2 Q1.c	Our cross-functional teams have more authority than departmental managers in making day-to-day decisions	0.4003*
Part 2 Q1.e	Horizontal communication is well practiced in our organisation	0.5676*
Part 2 Q1.f	We have a flat organisational structure	0.5531*
IT Alignment (consists of 2 factors)		
IT Competency (Factor 1)		
Part 2 Q2.a	Our IT enables our business processes to perform well	0.6971*
Part 2 Q2.b	Our IT is state-of-the-art	0.6887*
IT Integration (Factor 2)		
Part 2 Q2.c	The amount of data shared by employees is increasing	0.5470*
Part 2 Q2.d	Information Technology is very important to the improvement of our business processes	0.4682*
Part 2 Q2.e	Our Information Technology systems are well integrated across functional units	0.4887*
Strategy Alignment		
Part 2 Q3.b	The management team has identified our core processes	0.6251*
Part 2 Q3.c	Our core processes are an important input into our strategic plan	0.5839*
Part 2 Q3.d	Our operational improvements have a direct impact on our ability to compete	0.4754*
Part 2 Q3.e	We have sufficient measures to permit clear tracking of our performance	0.5119*
Part 2 Q3.f	Our current strategic plan identifies the projects we actually undertake to improve our business processes	0.6343*
Part 2 Q3.g	Our strategic planning process encourages information sharing and cross-functional cooperation	0.5109*
People Involvement (PINV)		
Executive Commitment		
Part 3 Q1.a	Top management has received adequate training in managing core processes	0.6822*
Part 3 Q1.b	Top management has sufficient knowledge on how to manage core processes	0.7261*
Part 3 Q1.c	Top management actively communicates to employees on how best to manage core processes	0.6884*
Part 3 Q1.d	Top management expressly recognises the need to identify core processes	0.5715*
Part 3 Q1.e	Top management allocates adequate resources to improve core processes	0.6366*

Table 5.12 Item-total correlation

Scale Items		Item-total Correlation
Employee Empowerment		
Part 2 Q1.g	We delegate managerial tasks to front-line staff	0.4920*
Part 3 Q2.a	Employees are increasing their involvement in the way their work is planned	0.5738*
Part 3 Q2.b	Employees are increasing their autonomy in making decisions that affect their work	0.6845*
Part 3 Q2.d	Employees are encouraged to fix problems they encounter	0.5428*
Part 3 Q2.e	Employees are interacting more with external customers	0.4959*
Organisational Performance (OPER)		
Part 5 Q1.a	Our organisation's competitive position has improved over the last two years	0.7095*
Part 5 Q1.b	The productivity of our employees has increased over the last two years	0.7226*
Part 5 Q1.c	Our organisation's profitability has increased over the last two years	0.6465*
Part 5 Q1.d (reversed)	The quality of our products and services has not improved over the last two years	0.4752*
Part 5 Q1.e	Our average cost per unit of product or service has decreased over the last two years	0.4518*

Note: * Observed significant level p less than 0.05

Table 5.12 (continued) Item-total correlation

5.7 Assessment of Reliability

To test the reliability of measurement instruments, there are generally three methods used. (1) the test-retest method: involves administering the same instrument to the same respondents at two separate points in time; (2) the equivalent-form method: measures the correlation between alternative instruments, designed to be as equivalent as possible, administered to the same group of subjects; (3) the internal consistency method: is employed when the researcher only administers the instrument once (Carmines and Zeller, 1979; Cooper and Emory, 1995; Pedhazur and Schmelkin, 1991).

Of these, the internal consistency method is by far the most common test found in the literature (Patnayakuni, 1997; Suryo, 1999; Wilson, 1997), and is the one used in this thesis.

Internal consistency was checked by computing Cronbach's alpha (Cronbach, 1951). This is the most frequently used test statistic in the literature for assessing internal consistency. Cronbach's alpha determines the amount of error in a measurement scale. The closer Cronbach's alpha is to one, the more reliable the measurement of the underlying variable (Cronbach, 1951). Alpha values of 0.6 or higher are recommended, with alpha values 0.5 or higher being considered acceptable (Churchill, 1979; Nunnally, 1978). Crobach's alpha values are detailed in Table 5.13 for each factor. Except for one scale - IT Integration - in IT Alignment, Cronbach's alpha scores are higher than 0.60. Hence, the measurement instrument can be considered as reliable.

	Number of Items in scale	Cronbach's Alpha
Process Alignment		
Horizontalism	5	0.6347
IT Alignment		
IT Competency (Factor 1)	3	0.8417
IT Integration (Factor 2)	2	0.5382
Strategy Alignment	6	0.7777
People Involvement		
Executive Commitment	5	0.8478
Employee Empowerment	5	0.6932
Organisational Performance	5	0.7387

Table 5.13 Scale reliability measures

5.8 Profile of Process Alignment, Process Improvement Competency and People Involvement at Component Level

The scores for each of the 8 components (Horizontalism, Strategy Alignment, Information Technology Alignment, Continuous Improvement Competency, Benchmarking Competency, Executive Commitment and Employee Empowerment) under the three variables (Process Alignment, Process Improvement Competency and People Involvement) could vary from 1 to 5.

To ease interpretation, scores were categorised into four groups: very high, high, medium and low. A company rated 'very high' if its score was greater than or equal to 4.5; 'high' if its score was between 4.0 and 4.5; 'medium' if its score was between 3.0 and 4.0 and 'low' if its score was less than 3.0. Table 5.14 shows the distribution of component ratings for Process Alignment.

Rating	Process Alignment		
	Horizontalism	Strategy Alignment	IT Alignment
Very High ($\geq$ 4.5)	2.0%	21.2%	17.3%
High (4 – 4.5)	15.9%	43.5%	34.6%
Medium (3 – 4)	62.9%	33.1%	39.6%
Low (< 3)	19.1%	2.3%	8.5%
Total	100.0%	100.0%	100.0%

Table 5.14 Ratings for Process Alignment at component level

Almost 63% of Australian Top 1000 companies rated a medium level of alignment between structure and core processes (Horizontalism). This suggested that Australia's Top 1000 companies needed to rethink the fit between their organisational structures and the co-ordination of workflow across functional units. Organisational structure appeared to mitigate against the efficient and effective operation of a company's core processes.

Almost 65% of companies rated high to very high the alignment between strategy and core processes (Strategy Alignment). This suggested that Australia's Top 1000 companies are adept at building and developing strategy around their core processes.

Only 52% of companies rated high to very high the alignment between IT and core processes (IT Alignment). Given the importance of IT in performing business processes, this suggested that Australia's Top 1000 companies needed to rethink their IT investments because they were not matching information needs of their core processes.

Table 5.15 shows the distribution of components ratings for Process Improvement Competency.

Rating	Process Improvement Competency		
	Continuous Improvement Competency	Process Reengineering Competency	Benchmarking Competency
Very High (≥ 4.5)	12.2%	7.8%	6.1%
High (4 – 4.5)	29.3%	23.3%	23.7%
Medium (3 – 4)	52.7%	62.2%	62.1%
Low (< 3)	5.9%	6.7%	8.1%
Total	100.0%	100.0%	100.0%

Table 5.15 Ratings for Process Improvement Competency at component level

Australia's Top 1000 companies are more successful implementing Continuous Improvement (41.5%, high to very high) than Process Reengineering (31.1%) and Benchmarking (29.8%). This was an expected result because Continuous Improvement initiatives were introduced some 5-10 years earlier than many Process Reengineering and Benchmarking initiatives. Yet overall, the success rate of the top 1000 Australian companies in implementing Process Improvement initiatives was still moderate at least as perceived by their top executives. The results support the widely available evidence that Process Improvement initiatives show a significant level of disappointment.

Table 5.16 shows the distribution of component ratings for People Involvement.

Rating	People Involvement	
	Executive Commitment	Employee Empowerment
Very High (≥ 4.5)	12.3%	7.8%
High (4 – 4.5)	33.5%	35.3%
Medium (3 – 4)	46.2%	53.7%
Low (< 3)	8.1%	3.1%
Total	100.0%	100.0%

Table 5.16 Ratings for People Involvement at component level

Almost 46% of Australian Top 1000 companies rated high and very high in terms of executive commitment toward a disciplined and structured approach to manage core processes. Just over 43% of Australian Top 1000 companies rated high and very high level in providing the level of authority needed by employees to manage their work environment. While these results are encouraging, there is still a room for improvement.

5.9 Summary

- In this thesis, the response rate of 27.4% was considered excellent and compares favourably to related studies conducted in Australia or overseas.
- Responding companies came from a wide range of industries.
- The largest percentage of companies had been in business between 16-45 years (34.2%).
- The average annual sales volume for the responding companies was 382.7 million (in AUD dollar)
- The majority of respondents was top executive (80.0%).
- Almost fifty-four percent of responding companies had conducted all process improvement initiatives (Continuous Improvement program, Benchmarking programs and Process Reengineering program).
- The measurement instruments of this thesis were rigorously examined to assess their validity and reliability. The results supported the validity and reliability of the measurement instruments.
- The majority of Australian Top 1000 companies had (a) a moderate level of alignment between structure and core processes; (b) a high level of fit between strategy and core processes; (c) a moderate to high fit between IT and core processes; (d) reasonable success when implementing process improvement initiatives; (e) a moderate to high commitment towards managing core processes and providing support authority to employees.

CHAPTER 6

DATA ANALYSIS

In this chapter, questionnaire data is analysed using the statistical methods described in section 4.6. First, the data is explored to check the assumptions required for parametric data analysis. Then in section 6.2, confirmation of previous research at component level is sought using Correlation Analysis. In section 6.3, Elaboration Analysis, which provides insights into the results of Correlation Analysis and Partial Correlation Analysis, is used to identify the mechanism explaining how Process Alignment, People Involvement and Process Improvement Competency relate to Organisational Performance. In section 6.4, Correlation Analysis is used to examine the associations of Process Alignment, People Involvement, Process Improvement Competency and Process Management Capability on Organisational Performance (Hypotheses 1 - 4). In section 6.5, Multiple Linear Regression is used to examine the two-way interaction effects of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance (Hypotheses 5 - 7). Finally, in section 6.6, Correlation Analysis is used to analyse the association between Process Management Capability and Core Process Performance (Hypotheses 8 - 13).

6.1 Exploratory Data Analysis

Exploratory data analysis is a detailed preliminary examination of data using a variety of descriptive statistics and displays. Tukey (1977, p 12) stated that "unless exploring data analysis uncovers indications, there is likely to be nothing for further data analysis". Norusis (1993) pointed out that the first step of any data analysis should always be data exploration. There are several reasons for exploring data: identifying mistakes in data coding, finding unusual and unexpected patterns or variability in the data, and evaluating the assumptions required before choosing statistical methods.

In this section, the emphasis is on evaluating assumptions. Normality, independence, and linearity checks are performed using the statistical software SPSS version 9.0. This is followed by a discussion on the number of observations available for data analysis.

(1) *Normality check*

The normal distribution of the data is an essential assumption in this thesis. Normality checks can be performed by three methods: stem and leaf plot, normal Q-Q plot and the Lilliefors test which is based on a modification of the Kolgomorov-Smirnov statistic. The Lilliefors test is not useful in this thesis due to the large sample size, which renders it unreliable. In the stem and leaf plot, the data distribution should indicate a bell-shaped curve. In the normal Q-Q plot, the data should fall approximately on a straight line if it is sampled from a normal distribution.

The results of the stem and leaf plot and normal Q-Q plot are depicted in Appendix E.1. All variables do not significantly deviate from the normal distribution. In general the assumption of normality holds.

(2) *Independence check*

Observations are statistically independent if one observation is not influenced by another observation (Wonnacot and Wonnacot, 1990). Observations are not independent if they are based on repeated measurements from the same experimental unit. In this thesis, the questionnaire survey was distributed to senior executives of the top 1000 Australian companies. It is likely that one company's response will not be influenced by another. To confirm this view, a Time Series (TS) plot was used. If the responses are statistically independent, there should be no discernible pattern in the TS plot (Norusis, 1993). The TS plots of all variables in this thesis are depicted in Appendix E.2. No discernible patterns were detected. These results support the claim that observations in the questionnaire are statistically independent.

(3) *Linearity check*

A linearity check was performed by graphing the scatter plots between independent variables: PALI, PICO, PINV, PALI*PICO, PALI*PINV, PINV*PICO and the dependent variable: OPER; and the scatter plots between PMC and the dependent variables: OPER and CPP.

Scatter plots help untangle and identify possible relationships. The scatter plots are depicted in Appendix E.3. The linearity of the relationship between independent and dependent variables was checked by visual inspection. In general, no non-linear relationships were detected.

(4) Number of observations available for data analysis

The number of observations for each variable and its components are depicted in Table 6.1.

Variable	Component	Number of observation
Process Alignment		251
	Horizontalism	251
	Strategy Alignment	260
	IT Alignment	260
People Involvement		255
	Executive Commitment	260
	Employee Empowerment	255
Process Improvement Competency		139
	Continuous Improvement Competency	205
	Process Reengineering Competency	180
	Benchmarking Competency	198
Process Management Capability		135
Organisational Performance		257

Table 6.1 Number of observations for each variable and its components

Although there were 260 usable questionnaire, the number of observations for each variable and their components was less than 260. This was due to two reasons:

(1) Not all responding companies had undertaken Continuous Improvement, Process Reengineering and Benchmarking. This reduced the number of observations for Process Management Capability to 135.

(2) Not all respondents answered the questions relating to Horizontalism, Employee Empowerment and Organisational Performance.

The effect of these two constraints reduced the number of observations available for data analysis to 134. According to Hair et al. (1995), the ratio of observations to independent variables should be at least 5 in order to have the ability to draw general conclusions from the results. They point out that the desired level of this ratio is between 15 to 20. In this thesis, the ratio of observations to independent variables is 134 / 6 = 22.3. Therefore, the number of observations (134) fulfills the requirement to draw statistically valid conclusion for Australia's Top 1000 companies.

6.2 Confirmation of Component Level Results

In the following section, confirmation of previous research at component level is sought using Correlation Analysis. This analysis was performed to determine the association between components of independent variables: PALI, PICO, and PINV and the dependent variable: OPER. The results of correlation coefficients and significant levels are depicted in Table 6.2.

Variable	Component	R	Sig. (n)	Result
PALI	Strategy Alignment	+ 0.398	0.000 (n = 257)	Positive Association
	IT Alignment	+ 0.356	0.000 (n = 257)	Positive Association
	Horizontalism	+ 0.311	0.000 (n = 248)	Positive Association
PINV	Employee Empowerment	+ 0.365	0.000 (n = 252)	Positive Association
	Executive Commitment	+ 0.349	0.000 (n = 257)	Positive Association
PICO	Process Reengineering Competency	+ 0.404	0.000 (n = 178)	Positive Association
	Benchmarking Competency	+ 0.308	0.000 (n = 197)	Positive Association
	Continuous Improvement Competency	+ 0.277	0.000 (n = 203)	Positive Association

Table 6.2 Correlation coefficient and significant levels between components of independent variables: PALI, PICO, PINV and dependent variable: OPER

All components of PALI are positively associated with OPER. Strategy Alignment has the strongest positive association with OPER, followed by IT Alignment and Horizontalism (R for Strategy alignment > R for IT alignment > R for Horizontalism).

Both components of PINV are positively associated with OPER. Both Employee Empowerment and Executive Commitment have similar effects on OPER (close correlation coefficients).

All components of PICO are positively associated with OPER. Process Reengineering Competency has the strongest positive association with OPER, followed by Benchmarking Competency and Continuous Improvement Competency (R for Process Reengineering Competency > R for Benchmarking Competency > R for Continuous Improvement Competency).

6.3 Mechanism of PALI, PICO and PINV on OPER

In this section, Elaboration Analysis, which provides insights into the results of Correlation Analysis and Partial Correlation Analysis, is used to identify the mechanism of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance.

According to Blalock (1964, 1985), there are many possible relationships between independent variables and the dependent variable that can be used to provide a rationale for explaining the mechanism that relates independent and dependent variables. The technique that explains the many possible relationships is called Elaboration Analysis (section 4.6.5).

Elaboration Analysis of the research model between independent variables (PALI, PICO and PINV) and dependent variable (OPER) is used to identify all possible relationships. Elaboration Analysis is used to examine the direction and strength of the relationships of PALI, PICO and PINV on OPER. This gives a better insight than Correlation Analysis alone into what happens to the relationships of PALI, PICO and PINV on OPER, when statistical control is introduced. In the following, the analysis of the twelve models in Figure 6.1 will be investigated.

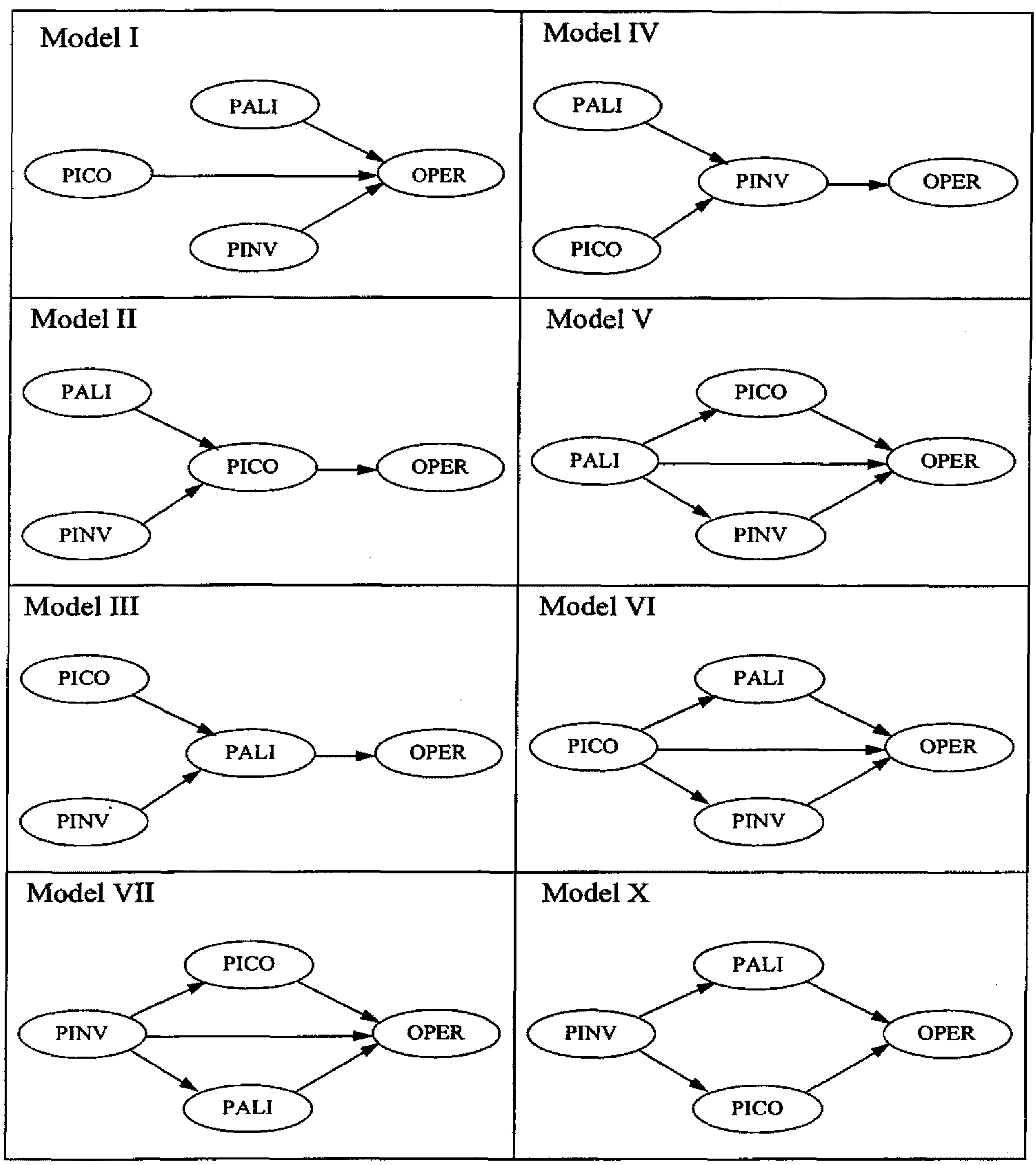


Figure 6.1 Possible relationships in Elaboration Analysis of PALI, PICO and PINV on OPER

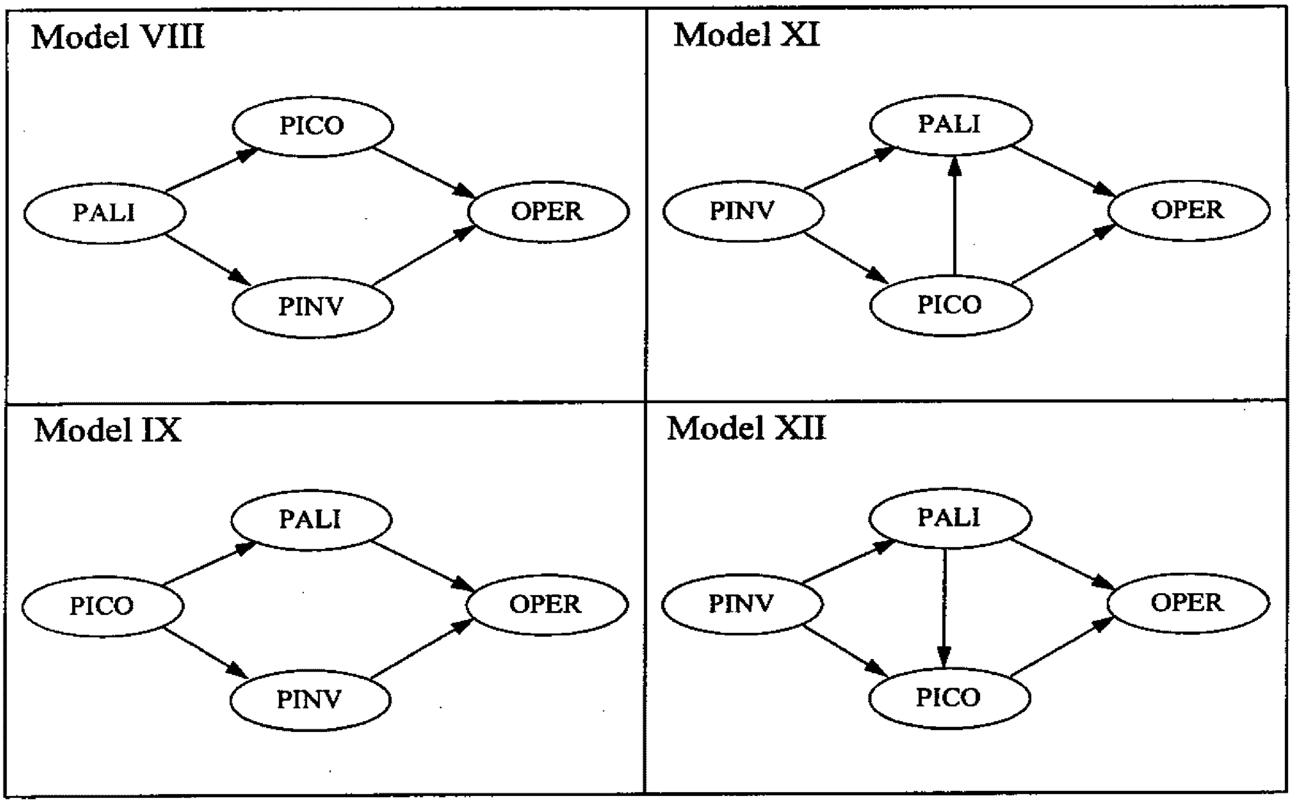


Figure 6.1 Possible Relationships in Elaboration Analysis of PALI, PICO and PINV on OPER (continued)

Twelve possible models have been proposed. The challenge is to determine the most adequate model to describe the mechanism that relates the independent variables of Process Management Capability (PALI, PICO and PINV) to Organisational Performance (OPER). Correlation Analysis is used to facilitate the search for this model.

The results of Correlation Analysis for determining the associations between (a) PALI to OPER, (b) PICO to OPER, (c) PINV to OPER, (d) PALI to PICO, (e) PINV to PICO, and (f) PINV to PALI are presented in Figure 6.2. All observed significant levels p are less than 0.05. This indicates that the all correlation coefficient R are positive and significantly different from 0.

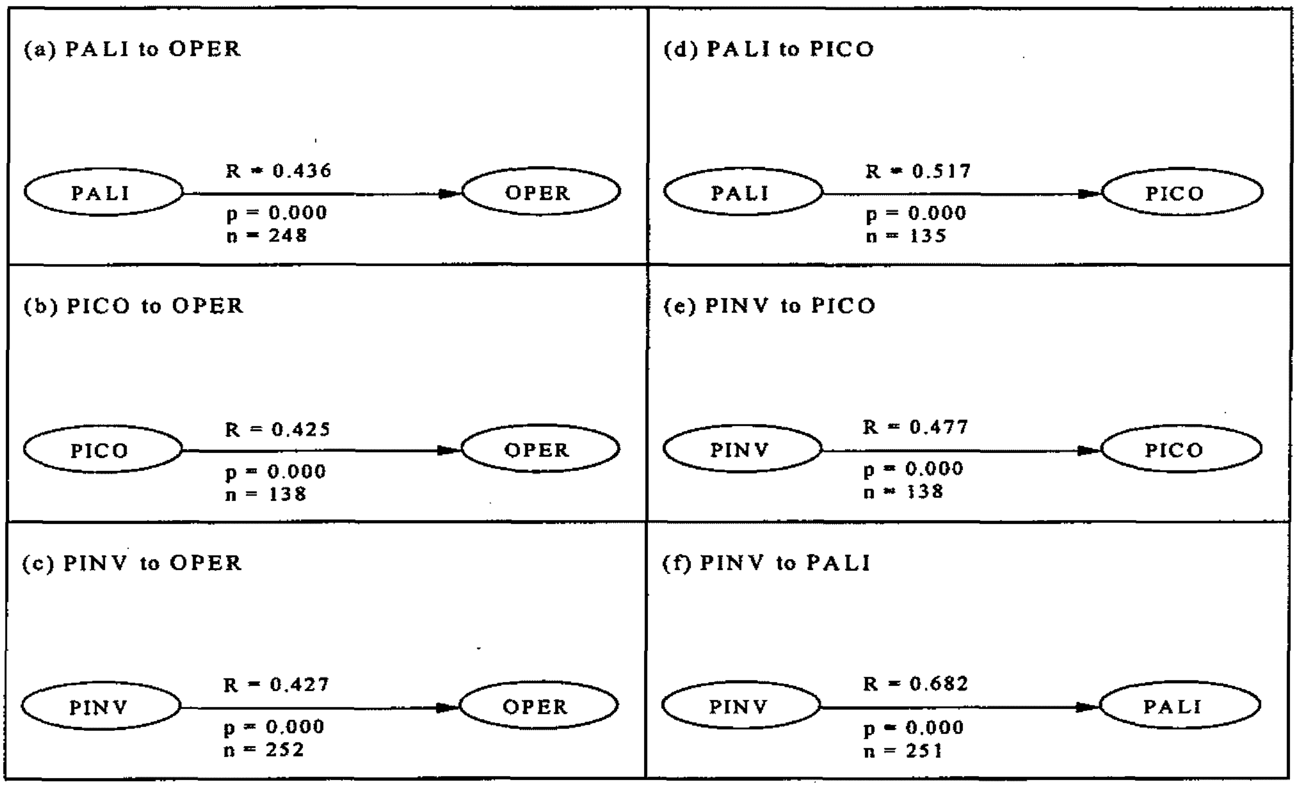


Figure 6.2 Correlations between PALI and OPER, PICO and OPER, PINV and OPER, PALI and PICO, PINV and PICO, and PINV and PALI

(1) Model I

Figure 6.3 illustrates the results for Model I that are copied from Figure 6.2.

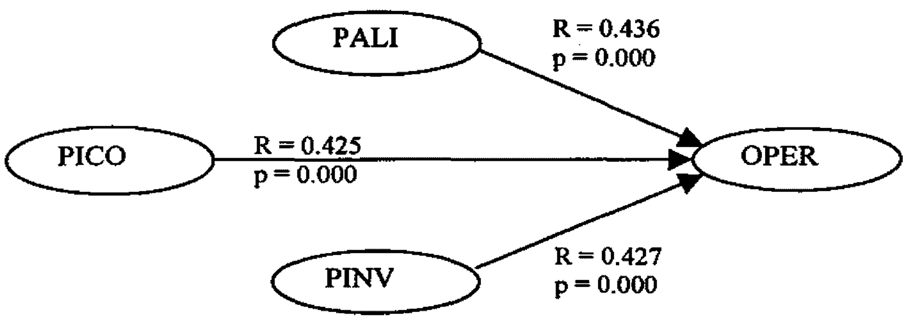


Figure 6.3 Model I

As shown in Figure 6.3, all observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model I shows positive associations from PALI to OPER, PICO to OPER, and PINV to OPER. The validity of Model I will now be further tested.

Model I implies there is a direct effect between each independent variable (PALI, PICO and PINV) on the dependent variable (OPER). If this implication is true, when PALI and PICO are controlled, the relationship between PINV and OPER should remain statistically significant. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PINV and OPER controlling for PALI and PICO was $R = 0.058$, $p = 0.509$, and $n = 130$. Therefore, when PALI and PICO are controlled, no statistically significant relationship exists between PINV and OPER.

Thus Model I does not adequately describe the mechanism of PALI, PICO and PINV on OPER. The next model, Model II, will now be tested for its validity.

(2) Model II

Figure 6.4 illustrates the results for Model II that are copied from Figure 6.2.

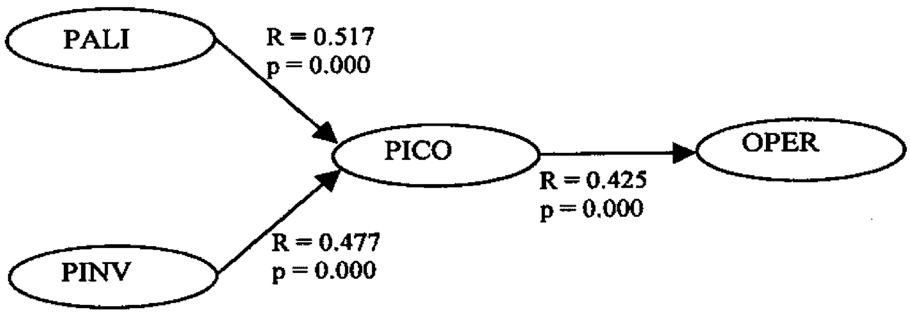


Figure 6.4 Model II

As shown in Figure 6.4, all observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model II indicates there are positive associations from PALI to PICO, PINV to PICO, and PICO to OPER. The validity of Model II will now be further tested.

In Model II, PICO acts as an intervening variable. An intervening variable is one that acts as both a consequence of an independent variable and a determinant of the dependent variable (Rosenberg, 1968). When an intervening variable is controlled, no relationship can be detected between the independent variable and dependent variable. Therefore, when PICO is controlled, PALI <u>should not</u> be associated with OPER. A similar argument holds for PINV. When PICO is controlled, PINV <u>should not</u> be associated with OPER. Model II would be deemed invalid if either PALI is associated with OPER when PICO is controlled or PINV is associated with OPER when PICO is controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PALI and OPER controlling for PICO was $R = 0.283$, $p = 0.001$, and $n = 131$. Therefore, when PICO is controlled, there exists a significant relationship between PALI and OPER. This is contrary to the assumption that PICO can act as an intervening variable. Thus Model II does not adequately describe the mechanism of PALI, PICO and PINV on OPER. Since Model II has now been discredited, there is no need to test whether PINV is associated with OPER when PICO is controlled.

The next model, Model III, will now be tested for its validity.

(3) Model III

Figure 6.5 illustrates the results for Model III that are copied from Figure 6.2.

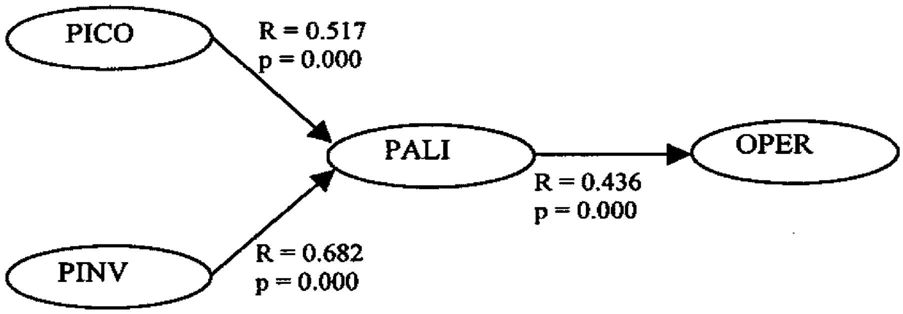


Figure 6.5 Model III

As shown in Figure 6.5, all the observed significant levels p are less than 0.05. This indicates that the all the correlation coefficients R are positive and significantly different from 0. Thus, Model III indicates there are positive associations from PICO to PALI, PINV to PALI, and PALI to OPER. The validity of Model III will now be further tested.

In Model III, PALI acts as an intervening variable. Again, an intervening variable is one that acts as both a consequence of an independent variable and a determinant of the dependent variable (Rosenberg, 1968). When an intervening variable is controlled, no relationship can be detected between the independent variable and dependent variable. Therefore, when PALI is controlled, PICO <u>should not</u> be associated with OPER. A similar argument holds for PINV. When PALI is controlled, PINV <u>should not</u> be associated with OPER. Model III would be deemed invalid if either PICO is associated with OPER when PALI is controlled or PINV is associated with OPER when PALI is controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PICO and OPER controlling for PALI was $R = 0.257$, $p = 0.003$, and $n = 131$. Therefore, when PALI is controlled, there exists a significant relationship between PICO and OPER. This is contrary to the assumption that PALI can act as an intervening variable. Thus Model III does not adequately describe the mechanism of PALI, PICO and PINV on OPER. Since Model III has now been discredited, there is no need to test whether PINV is associated with OPER when PALI is controlled.

The next model, Model IV, will now be tested for its validity.

(4) Model IV

Figure 6.6 illustrates the results for Model IV that are copied from Figure 6.2.

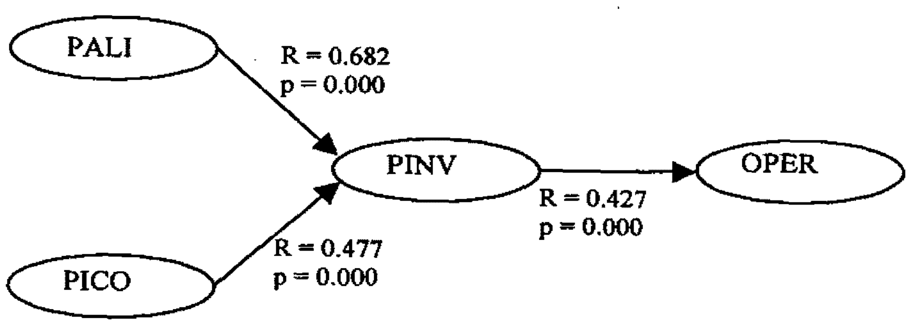


Figure 6.6 Model IV

As shown in Figure 6.6, all the observed significant levels p are less than 0.05. This indicates that the all the correlation coefficients R are positive and significantly different from 0. Thus, Model IV indicates there are positive associations from PALI to PINV, PICO to PINV, and PINV to OPER. The validity of Model IV will now be further tested.

In Model IV, PINV again acts as an intervening variable. Therefore, when PINV is controlled, PALI <u>should not</u> be associated with OPER. A similar argument holds for PICO. When PINV is controlled, PICO <u>should not</u> be associated with OPER. Model IV would be deemed invalid if either PALI is associated with OPER when PINV is controlled or PICO is associated with OPER when PINV is controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PALI and OPER controlling for PINV was $R = 0.219$, $p = 0.001$, and $n = 245$. Therefore, when PINV is controlled, there exists a significant relationship between PALI and OPER. This is contrary to the assumption that PINV can act as an intervening variable. Thus Model IV does not adequately describe the mechanism of PALI, PICO and PINV on OPER. Since Model IV has now been discredited, there is no need to test whether PICO is associated with OPER when PINV is controlled.

The next model, Model V, will now be tested for its validity.

(5) Model V

Figure 6.7 illustrates the results for Model V that are copied from Figure 6.2.

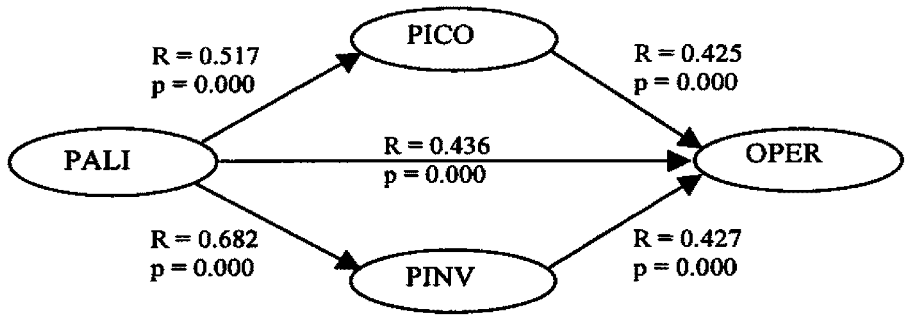


Figure 6.7 Model V

As shown in Figure 6.7, all the observed significant levels p are less than 0.05. This indicates that the all the correlation coefficients R are positive and significantly different from 0. Thus, Model V indicates there are positive associations from PALI to PICO, PALI to PINV, PICO to OPER, PALI to OPER, and PINV to OPER. The validity of Model V will now be further tested.

Model V suggests there is a direct effect from PINV to OPER. If Model V is valid, the association between PINV and OPER must remain statistically significant when PALI and PICO are controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PINV and OPER controlling for PALI and PICO was $R = 0.058$, $p = 0.509$, and $n = 130$. Therefore, when PALI and PICO are controlled, no statistically significant relationship exists between PINV and OPER. This makes Model V invalid. Thus Model V cannot adequately describe the mechanism of PALI, PICO and PINV on OPER. The next model, Model VI, will now be tested for its validity.

(6) Model VI

Figure 6.8 illustrates the results for Model VI that are copied from Figure 6.2.

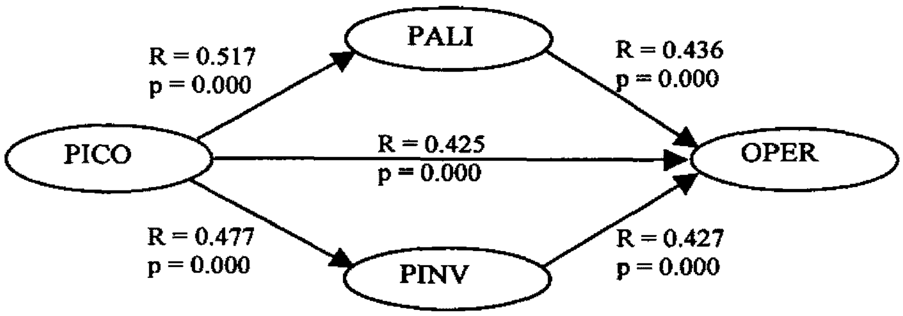


Figure 6.8 Model VI

As shown in Figure 6.8, all the observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model VI indicates there are positive associations from PICO to PALI, PICO to PINV, PALI to OPER, PICO to OPER, and PINV to OPER. The validity of Model VI will now be further tested.

Model VI suggests there is a direct effect from PINV to OPER. If Model VI is valid, the association between PINV and OPER must remain statistically significant when PALI and PICO are controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PINV and OPER controlling for PALI and PICO was $R = 0.058$, $p = 0.509$, and $n = 130$. Therefore, when PALI and PICO are controlled, no statistically significant relationship exists between PINV and OPER. This makes Model VI invalid. Thus Model VI cannot adequately describe the mechanism of PALI, PICO and PINV on OPER.

The next model, Model VII, will now be tested for its validity.

(7) Model VII

Figure 6.9 illustrates the results for Model VII that are copied from Figure 6.2.

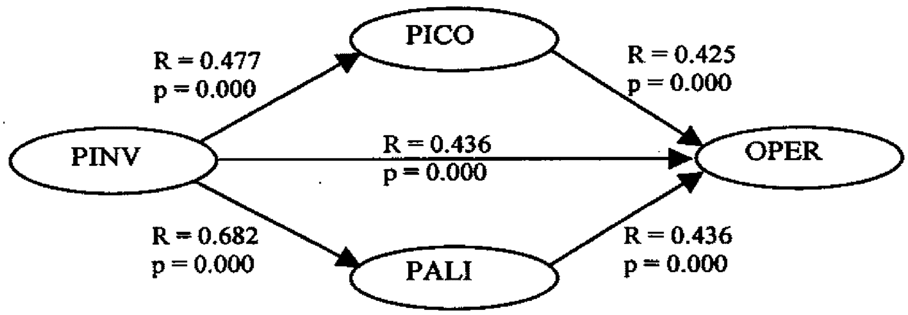


Figure 6.9 Model VII

As shown in Figure 6.9, all the observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model VII indicates there are positive associations from PINV to PICO, PINV to PALI, PICO to OPER, PINV to OPER, and PALI to OPER. The validity of Model VII will now be further tested.

Model VII suggests there is a direct effect from PINV to OPER. If Model VII is valid, the association between PINV and OPER must remain statistically significant when PALI and PICO are controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PINV and OPER controlling for PALI and PICO was R = 0.058, p = 0.509, and n = 130. Therefore, when PALI and PICO are controlled, no statistically significant relationship exists between PINV and OPER. This makes Model VII invalid. Thus Model VII cannot adequately describe the mechanism of PALI, PICO and PINV on OPER.

The next model, Model VIII, will now be tested for its validity.

(8) Model VIII

Figure 6.10 illustrates the results for Model VIII that are copied from Figure 6.2.

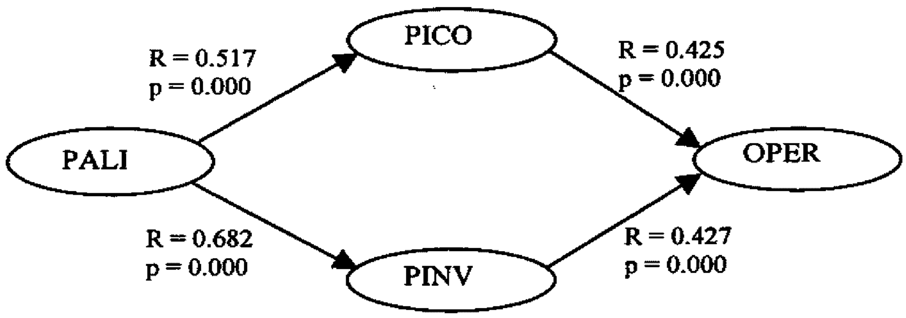


Figure 6.10 Model VIII

As shown in Figure 6.10, all the observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model VIII indicates there are positive associations from PALI to

PICO, PALI to PINV, PICO to OPER, and PINV to OPER. The validity of Model VIII will now be further tested.

Model VIII suggests there is an indirect effect from PALI to OPER. That is PALI first acts on PICO and PINV to effect OPER. If Model VIII is valid, the association between PALI and OPER must not statistically significant when PICO and PINV are controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PALI and OPER controlling for PICO and PINV was $R = 0.191$, $p = 0.028$, and $n = 130$. Therefore, when PICO and PINV are controlled, there exists a significant relationship between PALI and OPER. This invalidates Model VIII because if Model VIII was true the association between PALI and OPER could not be statistically significant when PICO and PINV were controlled. Thus Model VIII cannot adequately describe the mechanism of PALI, PICO and PINV on OPER.

The next model, Model IX, will now be tested for its validity.

(9) Model IX

Figure 6.11 illustrates the results for Model IX that are copied from Figure 6.2.

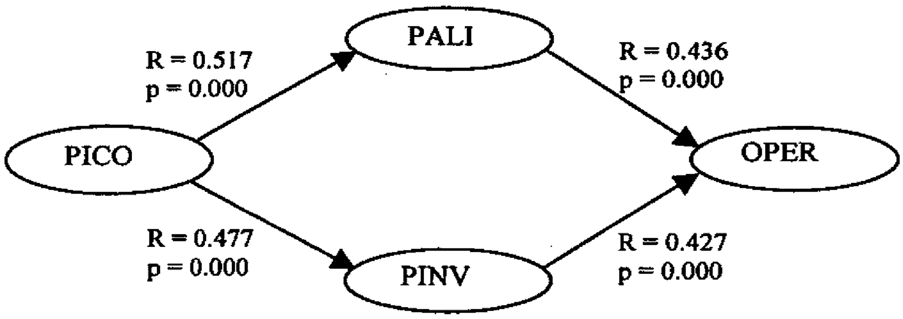


Figure 6.11 Model IX

As shown in Figure 6.11, all the observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model IX indicates there are positive associations from PICO to PALI, PICO to PINV, PALI to OPER, and PINV to OPER. The validity of Model IX will now be further tested.

Model IX suggests there is an indirect effect from PICO to OPER. Therefore, the association between PICO and OPER must not be statistically significant when PALI and PINV are controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PICO and OPER controlling for PALI and PINV was $R = 0.243$, $p = 0.005$, and $n = 130$. Therefore, when PALI and PINV are controlled, there exists a significant relationship between PICO and OPER. This invalidates Model IX because if Model IX were true the association between PICO and OPER could not be statistically significant when PALI and PINV are controlled. Thus Model IX cannot adequately describe the mechanism of PALI, PICO and PINV on OPER.

The next model, Model X, will now be tested for its validity.

(10) Model X

Figure 6.12 illustrates the results for Model X that are copied from Figure 6.2.

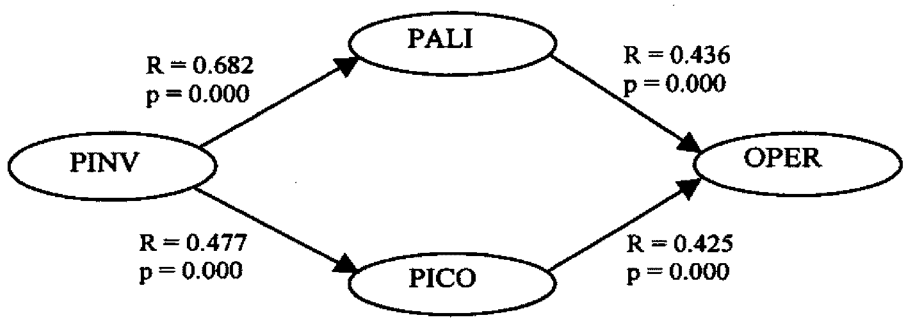


Figure 6.12 Model X

As shown in Figure 6.12, all the observed significant levels p are less than 0.05. This indicates that all the correlation coefficients R are positive and significantly different from 0. Thus, Model X indicates there are positive associations from PINV to PALI, PINV to PICO, PALI to OPER, and PICO to OPER. The validity of Model X will now be further tested.

Model X suggests there is an indirect effect from PINV to OPER. That is, PINV first acts on PALI and PICO to effect OPER. Therefore, the association between PINV and OPER should not be statistically significant when PALI and PICO are controlled. This relationship was examined by using Partial Correlation Analysis.

The result of Partial Correlation Analysis between PINV and OPER controlling for PALI and PICO was $R = 0.058$, $p = 0.509$, and $n = 130$. Thus, when PALI and PICO are controlled, no statistically significant relationship exists between PINV and OPER. This tends to suggest Model X adequately explains the relationship between PINV and OPER.

The absence of any relationship between PALI and PICO in Model X was further examined. According to Model X, there is no association between PALI and PICO. However, PINV is positively associated with PALI and PINV is also positively associated with PICO. This may indicate a relationship does exist between PALI and PICO, but it is spurious. The relationship is spurious if there is no meaningful or real relationship between the two variables. A spurious relationship is caused by an accidental association of each variable with some other variables.

To test whether or not there is a spurious relationship between PALI and PICO, Partial Correlation Analysis was performed. The result of Partial Correlation Analysis between PALI and PICO controlling for PINV was $R = 0.278$, $p = 0.001$, and $n = 132$. This means PALI is positively associated with PICO when PINV is controlled.

If Model X were true, there should be no relationship between PALI and PICO when PINV is controlled. However, the Partial Correlation Analysis above demonstrated that there is a relationship between PALI and PICO, when PINV is controlled. Thus

Model X cannot adequately describe the mechanism of PALI, PICO and PINV on OPER.

The next two models, Model XI and Model XII, will now be tested together for their validity.

(11) Model XI and Model XII

As showed in Figure 6.1, both Model XI and Model XII are similar. The difference is the direction of the relationship between PALI and PICO. Model XI suggests the direction of the relationship is from PICO to PALI, while Model XII suggests the direction of the relationship is from PALI to PICO.

Multiple Regression Analysis was performed to determine which model was best. Beta (the standardised partial regression coefficient) of the relationship from PICO to PALI will be compared to Beta (standardised partial regression coefficient) of the relationship from PALI to PICO. According to Yamane (1973), the best model will have the largest value of Beta.

(11.1) Model XI

Figure 6.13 illustrates the results for Model XI that are copied from Figure 6.2 and Table 6.3.

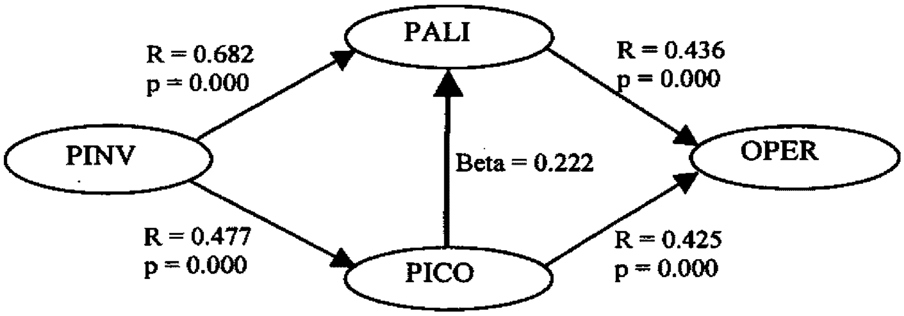


Figure 6.13 Model XI

Regression 1 in Table 6.3 shows the results of Multiple Linear Regression when PALI is the dependent variable and PICO and PINV are the two independent variables.

Regression 1: Dependent variable: PALI
Independent variables: PICO; PINV

Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.741	0.549	0.542	0.303	1.983

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	14.690	2	7.345	80.192	0.000 (significant)
Residual	12.091	132	0.092		
Total	26.781	134			

Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	0.438	0.283		1.550	0.123	
PICO	0.238	0.072	0.222	3.320	0.001 (significant)	1.310
PINV	0.653	0.072	0.607	9.060	0.000 (significant)	1.310

Table 6.3 Regression of PICO and PINV on PALI

The diagnostic checks for Regression 1 are presented in Appendix F. The normal P-P plot indicated that the residuals did not significantly deviate from the normal distribution. The assumptions of Multiple Linear Regression were satisfied for Regression 1.

When PINV is controlled, the Beta of PICO in Regression 1 is +0.222 and is significantly different from 0 ($t = 3.320$, $p = 0.001$).

(11.2) Model XII

Figure 6.14 illustrates the results for Model XII that are copied from Figure 6.2 and Table 6.4.

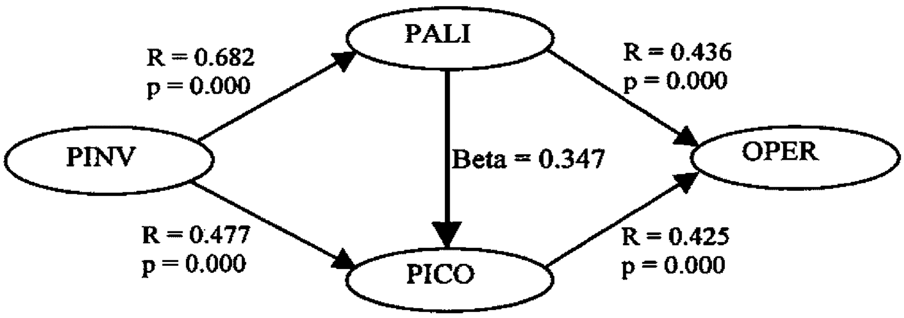


Figure 6.14 Model XII

Regression 2 in Table 6.4 shows the results of Multiple Linear Regression when PICO is the dependent variable and PALI and PINV are the two independent variables.

Regression 2: Dependent variable: PICO
Independent variables: PALI; PINV

Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.544	0.296	0.285	0.354	2.080

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.930	2	3.465	27.708	0.000 (Significant)
Residual	16.507	132	0.125		
Total	23.437	134			

Coefficients

	Unstandardised Coefficients		Standardised Coefficients	T	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	1.630	0.302		5.401	0.000	
PALI	0.324	0.098	0.347	3:320	0.001 (significant)	2.044
PINV	0.241	0.105	0.239	2.287	0.024 (significant)	2.044

Table 6.4 Regression of PALI and PINV on PICO

The diagnostic checks for Regression 2 are presented in Appendix F. The normal P-P plot indicated that the residuals did not significantly deviate from the normal distribution. The assumptions of Multiple Linear Regression were satisfied for Regression 2.

When PINV is controlled, the Beta of PALI in Regression 2 is +0.347 and is significantly different from 0 ($t = 3.320$, $p = 0.001$).

The strength of the relationship in Model XII from PALI to PICO (Beta = 0.347) when controlling for PINV is greater than the strength of the relationship in Model XI from PICO to PALI (Beta = 0.222) when controlling for PINV. Thus Model XII provides a stronger result than Model XI.

Model XII is the most adequate model to describe the mechanism that relates the independent variables within Process Management Capability (PALI, PICO and PINV) to Organisational Performance (OPER). Model XII will now be used to test hypotheses 1, 2 and 3.

6.4 The Association Between PALI, PINV, PICO, PMC on OPER (Testing Research Hypothesis 1 to Hypothesis 4)

In this section, Correlation Analysis is used to examine the association of Process Alignment, People Involvement, Process Improvement Competency, Process Management Capability on Organisational Performance (Hypotheses 1, 2, 3 and 4).

H 1 Process Alignment is positively associated with Organisational Performance

H 2 People Involvement is positively associated with Organisational Performance

H 3 Process Improvement Competency is positively associated with Organisational Performance

H 4 Process Management Capability is positively associated with Organisational Performance

Hypotheses 1, 2, and 3 are tested based on the results for Model XII in Figure 6.14.

Hypothesis 1, that Process Alignment (PALI) is positively associated with Organisational Performance (OPER), is supported (R = 0.436, p = 0.000 and n = 248).

Hypothesis 2, that People Involvement (PINV) is positively associated with Organisational Performance (OPER), is supported (R = 0.427, p = 0.000 and n = 252). However, Figure 6.14 shows that the link from PINV to OPER is not direct. PINV is positively associated with OPER through PALI and PICO. Therefore, Hypothesis 2 is supported indirectly.

Hypothesis 3, that Process Improvement Competency (PICO) is positively associated with Organisational Performance (OPER), is supported (R = 0.425, p = 0.000 and n = 138).

Hypothesis 4 is tested based on the results of Correlation Analysis, shown in Figure 6.15. The hypothesis that Process Management Capability (PMC) is positively associated with Organisational Performance (OPER), is supported (R = 0.491, p = 0.000 and n = 134).

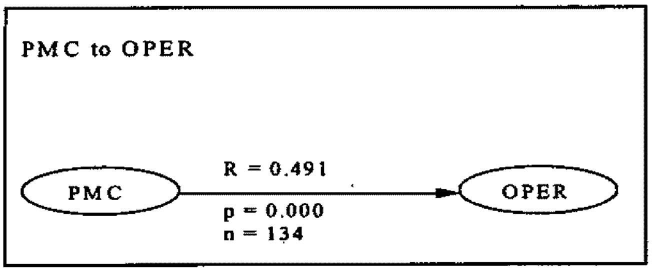


Figure 6.15 Correlation between PMC and OPER

6.5 Interaction Effects of PALI, PINV, PICO on OPER

In this section, Multiple Linear Regression is used to examine the interaction effects of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance (Hypotheses 5 - 7).

H 5 There is a positive interaction between Process Alignment and Process Improvement on Organisational Performance

H 6 There is a positive interaction between Process Alignment and People Involvement on Organisational Performance

H 7 There is a positive interaction between People Involvement and Process Improvement on Organisational Performance

In order to test Hypotheses 5, 6 and 7, a backward Multiple Linear Regression was performed to determine the interactions between PALI and PINV, PALI and PICO, and PINV and PICO, on OPER. The backward elimination equation-building method in SPSS version 9.0 begins with all candidate variables (PALI, PICO, PINV, PALI*PINV, PALI*PICO, and PINV*PICO) in the model, and at each step removes the least useful variable (lowest F-to-remove). Variables are removed until an established criterion for F can no longer be met. Variables with F values less than 2.71 are eligible for removal (Norusis, 1993).

6.5.1 Testing Research Hypothesis 5

H 5 There is a positive interaction between Process Alignment and Process Improvement on Organisational Performance

Table 6.5 shows the results of a backward Multiple Linear Regression, labelled Regression 3, consisting of OPER as the dependent variable and six independent variables: PALI, PINV, PICO, PALI*PINV (interaction of PALI and PINV), PALI*PICO (interaction of PALI and PICO), and PINV*PICO (interaction of PINV and PICO). The variables PINV, PALI*PINV and PINV*PICO were removed during backward elimination. Three independent variables (PALI, PICO, and PALI*PICO) remained.

Regression 3: Dependent variable: OPER
Independent variables: PALI; PICO; PINV; PALI*PINV; PALI*PICO; PINV*PICO

Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
	0.520	0.271	0.254	0.534	2.200

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	13.765	3	4.588	16.091	0.000 (significant)
Residual	37.069	130	0.285		
Total	50.833	133			

Coefficients

	Unstandardised Coefficients		Standardised Coefficients	T	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	-4.959	2.877		-1.724	0.087	
PALI	1.946	0.749	1.410	2.598	0.010	52.512 (High MC)
PICO	1.971	0.769	1.338	2.562	0.012	48.623 (High MC)
PALI*PICO	-0.407	0.196	-1.905	-2.074	0.040	150.450 (High MC)

Note: MC = Multicollinearity

Table 6.5 Regression of PALI, PICO, PINV and its interactions on OPER

The model adequately predicts OPER (F = 16.091, p = 0.000). The Variance Inflation Factors (VIFs) of PALI, PICO, and PALI*PICO are 52.51, 48.62 and 150.45, respectively. Since all VIFs are much higher than 10.00, multicollinearity exists. Consequently, the sign and the values of the regression coefficients may be misleading (Mendenhall and Sincich, 1993).

To reduce multicollinearity, the independent variable PICO was dropped. Multiple Linear Regression was performed again with OPER as the dependent variable and PALI and PALI*PICO as the two independent variables. The results are shown as Regression 4 in Table 6.6.

Regression 4: Dependent variable: OPER
Independent variables: PALI; PALI*PICO

Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.484	0.234	0.222	0.545	2.175

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	11.893	2	5.946	20.004	0.000 (significant)
Residual	38.941	131	0.297		
Total	50.833	133			

Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	2.315	0.476		4.862	0.000	
PALI	0.106	0.217	0.077	0.486	0.628	4.236
PALI*PICO	0.089	0.034	0.415	2.639	0.009 (significant)	4.236

Table 6.6 Regression of PALI and PALI*PICO on OPER

The model adequately predicts OPER (F value = 20.004, p = 0.000). The VIF of this model is 4.24. Since this is less than 10.00, Regression 4 does not suffer from multicollinearity.

Diagnostic checks were undertaken to examine the assumptions behind Multiple Linear Regression. The diagnostic checks for Regression 4 are presented in Appendix F. The normal P-P plot indicated that the residuals did not significantly deviate from the normal distribution. The assumptions of Multiple Linear Regression were satisfied.

The standardised coefficient Beta of PALI*PICO in Regression 4 is +0.415 and is significantly different from 0 (t= 2.639, p = 0.009). Therefore, Hypothesis 5, that there is positive interaction between PALI and PICO on OPER, was supported.

6.5.2 Testing Research Hypothesis 6

H 6 There is a positive interaction between Process Alignment and People Involvement on Organisational Performance

Table 6.7 shows the results of Multiple Linear Regression, labelled Regression 5, consisting of OPER as the dependent variable and three independent variables: PALI*PINV (interaction of PALI and PINV), PALI*PICO (interaction of PALI and PICO), and PINV*PICO (interaction of PINV and PICO).

Regression 5: Dependent variable: OPER
Independent variables: PALI*PINV; PALI*PICO; PINV*PICO

Summary [e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.485	0.235	0.218	0.5468	2.174

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	11.969	3	3.990	13.345	0.000 (significant)
Residual	38.864	130	0.299		
Total	50.833	133			

Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	2.465	0.261		9.428	0.000	
PALI*PICO	2.502E-02	0.042	0.359	1.820	0.043	6.607
PALI*PINV	6.532E-03	0.030	0.068	0.444	0.658	4.037
PINV*PICO	3.238E-03	0.042	0.072	0.377	0.706	6.172

Table 6.7 Regression of PALI*PICO, PALI*PINV and PINV*PICO on OPER

The model adequately predicts OPER (F value = 13.345, p = 0.000). The Variance Inflation Factors (VIFs) of PALI*PICO, PALI*PINV, and PINV*PICO are 6.61, 4.04 and 6.17, respectively. Since all VIFs are less than 10.00, Regression 5 does not suffer from multicollinearity.

The diagnostic checks for Regression 5 are presented in Appendix F. The normal P-P plot indicated that the residuals did not significantly deviate from the normal distribution. The assumptions of Multiple Linear Regression were satisfied.

The standardised coefficient Beta of PALI*PICO in Regression 5 is +0.359 and is significantly different from 0 (t = 1.820, p = 0.043). Therefore, the existence of interaction of PALI and PICO on OPER was supported. Regression 4 in Table 6.6 also indicated this was the case.

The standardised coefficient Beta of PALI*PINV in Regression 5 is +0.068 and is not significantly different from 0 ($t = 0.444$, $p = 0.658$). No interaction between PALI and PINV on OPER was found. Thus, Hypothesis 6, that there is positive interaction between PALI and PINV on OPER, was not supported.

6.5.3 Testing Research Hypothesis 7

H 7 There is a positive interaction between People Involvement and Process Improvement on Organisational Performance

Regression 5 in Table 6.7 shows the standardised coefficient Beta of PINV*PICO is +0.072 and is not significantly different from 0 ($t = 0.377$, $p = 0.706$). No interaction between PINV and PICO on OPER was found. Thus, Hypothesis 7, that there is positive interaction between PINV and PICO on OPER, was not supported.

6.6 Association Between PMC and CPP

In this section, Correlation Analysis is used to analyse the association between Process Management Capability and Core Process Performance (Hypothesis 8 to Hypothesis 13).

This thesis examines the effect of Process Management Capability (PMC) on the performance of core processes. The names of the six core processes are adapted from International Benchmarking Clearinghouse (1995) and Arthur Andersen (1998). The variables representing Core Process Performance are: (1) the process for determining customer needs, PDCN; (2) the process for monitoring changes in customer expectations, MCCE; (3) the process for designing new products and services, DNPS; (4) the process for providing products and services to customers, PPSC; (5) the process for billing customers, PBCU; and (6) the process for providing after-sales services, PASS.

The six Hypotheses 8 to 13 examine the association between Process Management Capability and Core Process Performance for each core process. Tests are performed using Correlation Analysis. The results of Correlation Analysis for determining the association between (1) PMC to PDCN, (2) PMC to MCCE, (3) PMC to DNPS, (4) PMC to PPSC, (5) PMC to PBCU, and (6) PMC to PASS are presented in Figure 6.16.

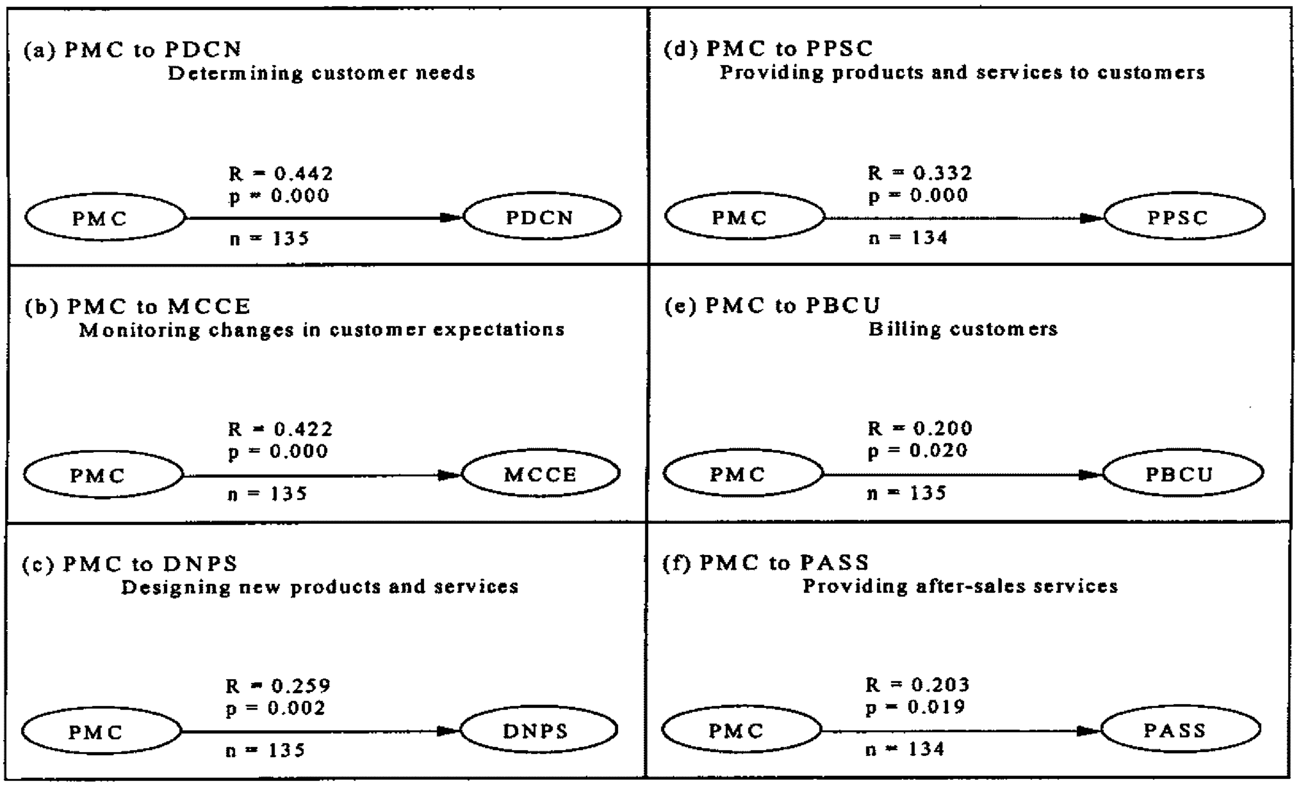


Figure 6.16 Correlation from PMC to PDCN, PMC to MCCE, PMC to DNPS, PMC to PPSC, PMC to PBCU, and PMC to PASS

6.6.1 Testing Research Hypothesis 8

H 8 Process Management Capability is positively associated with the performance of the process for determining customer needs

As shown in Figure 6.16, the coefficient correlation R of PMC to PDCN is +0.442 and is significantly different from 0 ($p = 0.000$ and $n = 135$). This indicates that Hypothesis 8, that Process Management Capability is positively associated with the performance of the process for determining customer needs, is supported.

6.6.2 Testing Research Hypothesis 9

H 9 Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations

As shown in Figure 6.16, the coefficient correlation R of PMC to MCCE is +0.422 and is significantly different from 0 ($p = 0.000$ and $n = 135$). This indicates that Hypothesis 9, that Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations, is supported.

6.6.3 Testing Research Hypothesis 10

H 10 Process Management Capability is positively associated with the performance of the process for designing new products and services

As shown in Figure 6.16, the coefficient correlation R of PMC to DNPS is +0.259 and is significantly different from 0 ($p = 0.002$ and $n = 135$). This indicate that Hypothesis 10, that Process Management Capability is positively associated with the performance of the process for designing new products and services, is supported.

6.6.4 Testing Research Hypothesis 11

H 11 Process Management Capability is positively associated with the performance of the process for providing products and services to customers

As shown in Figure 6.16, the coefficient correlation R of PMC to PPSC is +0.332 and is significantly different from 0 ($p = 0.000$ and $n = 134$). This indicates that Hypothesis 11, that Process Management Capability is positively associated with the performance of the process for providing products and services to customers, is supported.

6.6.5 Testing Research Hypothesis 12

H 12 Process Management Capability is positively associated with the performance of the process for billing customers

As shown in Figure 6.16, the coefficient correlation R of PMC to PBCU is +0.200 and is significantly different from 0 ($p = 0.020$ and $n = 135$). This indicates that Hypothesis 12, that Process Management Capability is positively associated with the performance of the process for billing customers, is supported.

6.6.6 Testing Research Hypothesis 13

H 13 Process Management Capability is positively associated with the performance of the process for providing after-sales services

As shown in Figure 6.16, the coefficient correlation R of PMC to PASS is +0.203 and is significantly different from 0 ($p = 0.019$ and $n = 134$). This indicates that Hypothesis 13, that Process Management Capability is positively associated with the performance of the process for providing after-sales services, is supported.

6.4 Summary

Table 6.8 summarises hypotheses 1 to 13 and their test results. From the thirteen hypotheses, eleven were supported. These supported were: H1, H2, H3, H4, H6, H8, H9, H10, H11, H12, and H13. Those not supported were: H5 and H7. The findings are discussed in greater detail in the next chapter.

Hypotheses		R	Sig.	Hypotheses testing	Result
Positive Association Between Organisational Performance and:					
1 Process Alignment	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.252	0.028	reject H_0	**Supported**
2 People Involvement	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.427	0.000	reject H_0	**Supported** *(indirect)
3 Process Improvement Competency	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.259	0.005	reject H_0	**Supported**
4 Process Management Capability	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.491	0.000	reject H_0	**Supported**
Positive Interaction to the Organisational Performance Between:					
Hypotheses		**Beta**	**Sig.**	**Hypotheses testing**	**Result**
5 Process Alignment and People Involvement	$H_0: \beta \le 0$ $H_A: \beta > 0$	0.068	0.658	not reject H_0	**Not supported**
6 Process Alignment and Process Improvement Competency	$H_0: \beta \le 0$ $H_A: \beta > 0$	0.415	0.009	reject H_0	**Supported**
7 people involvement and Process Improvement Competency	$H_0: \beta \le 0$ $H_A: \beta > 0$	0.072	0.706	not reject H_0	**Not supported**
Positive Association Between Process Management Capability and the Performance of:					
Hypotheses		**R**	**Sig.**	**Hypotheses testing**	**Result**
8 the process for determining customer need	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.442	0.000	reject H_0	**Supported**
9 the process for monitoring changes in customer expectation	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.422	0.000	reject H_0	**Supported**
10 the process for designing new products and services	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.259	0.002	reject H_0	**Supported**
11 the process for providing products and services to customers	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.332	0.000	reject H_0	**Supported**
12 the process for billing customers	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.200	0.020	reject H_0	**Supported**
13 the process for providing after-sales services	$H_0: \rho \le 0$ $H_A: \rho > 0$	0.203	0.019	reject H_0	**Supported**

Note:
* : See Model XII for mechanism

Table 6.8 Summary of results of hypotheses testing

CHAPTER 7

FINDINGS AND DISCUSSION

Results of the data analysis in Chapter 6 indicated that eleven research hypotheses were supported, and two were not supported. This chapter examines and discusses the findings from these hypotheses. It consists of six sections.

In section 7.1, this thesis examines and discusses the relationship between Process Alignment and Organisational Performance. Then in section 7.2, the relationship between People Involvement and Organisational Performance is examined and discussed. In section 7.3, the relationship between Process Improvement Competency and Organisational Performance is examined and discussed. Next, in section 7.4, we examine and discuss the two-way interactions of Process Alignment, People Involvement and Process Improvement Competency on Organisational Performance. Section 7.5 examines and discusses (1) the relationship between Process Management Capability and Organisational Performance, and (2) the relationship between Process Management Capability and Core Process Performance. Finally, section 7.6 presents the summary of this chapter.

7.1 Process Alignment

Process Alignment is an aggregate of three components: Horizontalism, Strategy Alignment, and IT Alignment. It measures the synergies of structure, strategy and IT on process. In the following, the components of Process Alignment are examined first and then Process Alignment as an aggregate variable is discussed.

7.1.1 Process Alignment – Its Components

This thesis found that Horizontalism is positively associated with Organisational Performance. Companies whose management structure focuses on the coordination of activities across functions will increase business performance. This finding supports previous studies and anecdotal evidence in the literature (Coleman, 1991; Chung, 1994; Hall et al., 1993; Klaus, 1989; Ostroff and Smith, 1992; Sinclair, 1994; Snowden, 1991). This thesis also found that IT Alignment is positively associated with Organisational Performance. Companies whose IT systems are built around the information needs of core processes will increase business performance. This finding is also supported by Gagnon and Dragon (1998), Powell and Dent-Micallef (1997), and Luftman et al. (1993). This thesis also found that Strategy Alignment is positively associated with Organisational Performance. Companies who consider the relationship between core processes and the creation and implementation of strategy will increase business performance. This supports studies and anecdotal evidence in the literature (Hinterhuber, 1995; Lee and Dale, 1998; Schmidt and Treichler, 1998; Zairi, 1997).

This thesis confirms that the relationships between the components of Process Alignment and Organisational Performance known in US and UK studies, also hold in Australia.

This thesis also found that Strategy Alignment has the strongest positive association with Organisational Performance, followed by IT Alignment and then Horizontalism. This stresses the primary importance of developing and implementing strategy around core processes. This ranking has not been discussed in the literature.

7.1.2 Process Alignment – As an Aggregate Variable

This thesis found that Process Alignment as an aggregate of Horizontalism, Strategy Alignment, and IT Alignment, is positively associated with Organisational Performance. Companies whose IT systems are built around the information needs of core processes, who consider the relationship between core processes and the creation and implementation of strategy and whose management structure focuses on the coordination of activities across functions tend to achieve better Organizational Performance. To date, many studies have been conducted on the components of Process Alignment (cited in section 7.1.1) and this thesis has confirmed these studies. No empirical evidence, however, has been found in the literature to support the relationship between Process Alignment and Organisational Performance at an aggregate level. This includes a lack of evidence for Australia's Top 1000 companies.

This thesis found that Process Alignment affects Organisational Performance in three ways. These ways and explanations are depicted in Table 7.1.

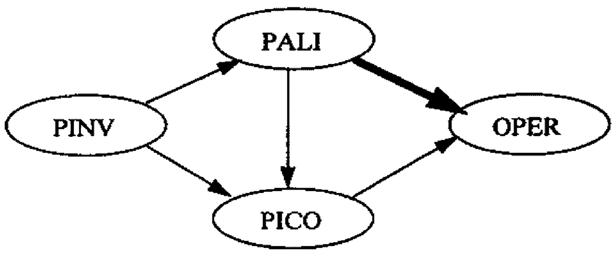
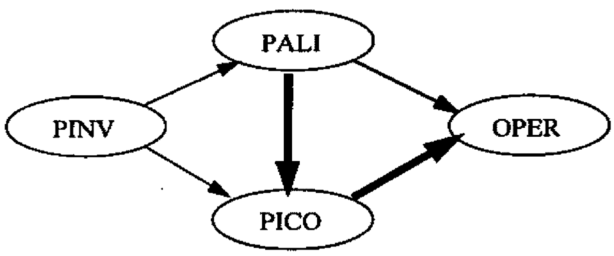
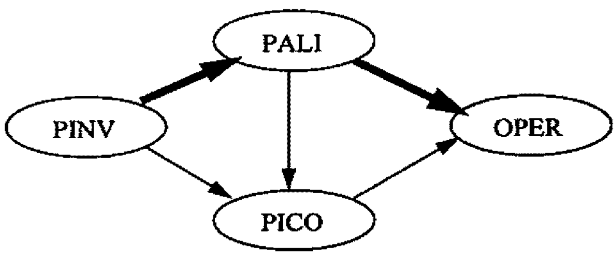
(1) Direct effect from Process Alignment to Organisational Performance Direct Effect 	***Explanation*** Higher Process Alignment leads to better Organisational Performance.
(2) Indirect effect from Process Alignment to Organisational Performance through Process Improvement Competency Indirect Effect 	Higher Process Alignment leads to better Organisational Performance, but the relationship is an indirect one. Higher Process Alignment leads to higher Process Improvement Competency which in turn leads to better Organisational Performance
(3) Process Alignment acts as an intervening variable between People Involvement and Organisational Performance Intervening Variable 	People Involvement affects Organisational Performance through Process Alignment. Higher People Involvement creates better Process Alignment which in turn improves Organisational Performance.

Table 7.1 Relationships between Process Alignment and Organisational Performance

7.2 Process Improvement Competency

Process Improvement Competency is an aggregate of three components: Continuous Improvement Competency, Process Reengineering Competency, and Benchmarking Competency. It measures the capability of an organisation in successfully implementing process improvement programs. In the following, components of Process Improvement Competency are examined first and then Process Improvement Competency as an aggregate variable is discussed.

7.2.1 Process Improvement Competency – Its Components

This thesis found that Continuous Improvement Competency is positively associated with Organisational Performance. Companies who successfully pursue incremental improvement programs will increase their business performance. This finding supports previous studies and anecdotal evidence in the literature (Berry, 1991; Bradley, 1991; Garvin, 1988; Davenport, 1993b; Harrington, 1995; Hunt, 1995; Porter, 1993; Whitford and Andrew, 1994).

This thesis also found that Process Reengineering Competency is positively associated with Organisational Performance. Companies that successfully undertake radical change programs will increase their business performance. This supports anecdotal evidence and studies in the literature (Guha et al., 1997; Guimaraes and Bond, 1996; Kettinger et al., 1995; Lowenthal, 1994; Roberts, 1994 and Sethi and King, 1998).

This thesis also found that Benchmarking Competency is positively associated with Organisational Performance. Companies that successfully pursue best practice will increase their business performance. This finding was supported by Bracken (1992), Brocka ad Brocka (1992), Edosomwan (1991), Evans (1994), Finnigan (1996), Hunt (1995), Macneil et al. (1994), Murray (1991) and Porter (1993).

This thesis confirms the relationship between the components of Process Improvement Competency and Organisational Performance found in US, UK studies and in previous Australian studies (O'Neill and Sohal, 1998; Samson and Terziovski, 1999; Spagnola, 1996).

This thesis also found that Process Reengineering Competency has the strongest positive association with Organisational Performance, followed by Benchmarking Competency and then Continuous Improvement Competency. This stresses the primary importance of undertaking radical process change to achieve higher gains in performance. This ranking has not been discussed in the literature.

7.2.2 Process Improvement Competency – As an Aggregate Variable

This thesis found that the research hypothesis: Process Improvement Competency is positively associated with Organisational Performance was supported. Companies who successfully pursue incremental improvement programs, successfully undertake radical change programs, and successfully pursue best practice will tend to create higher levels of competitive advantage. To date, many studies have been conducted on the individual components of Process Improvement Competency - Continuous

Improvement Competency, Process Reengineering Competency, and Benchmarking Competency - and business performance. No empirical evidence, however, was found in the literature to support the relationship between all three and Organisational Performance in the one study. This includes a lack of evidence for Australia's Top 1000 companies.

This thesis found that Process Improvement Competency affects Organisational Performance in two ways. These ways and explanations are depicted in Table 7.2.

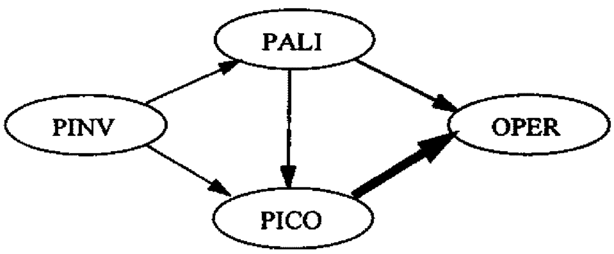
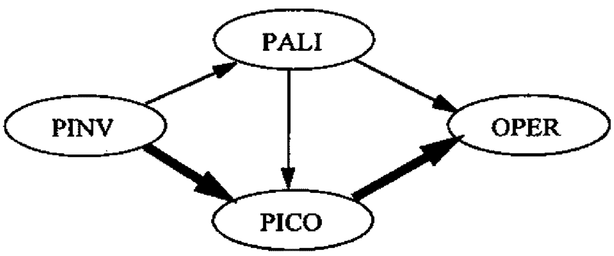
(1) Direct effect from Process Improvement Competency to Organisational Performance Direct Effect  	***Explanation*** Higher Process Improvement Competency leads to better Organisational Performance.
(2) Process Improvement Competency acts as an intervening variable between People Involvement and Organisational Performance Intervening Variable  	People Involvement affects Organisational Performance through Process Improvement Competency. Higher People Involvement creates better Process Improvement Competency which in turn improves Organisational Performance.

Table 7.2 Relationships between Process Improvement Competency and Organisational Performance

7.3 People Involvement

People Involvement is an aggregate of two components: Executive Commitment and Employee Empowerment. It measures the extent of the involvement of all people in the management of processes. In the following, the components of People Involvement are examined first and then People Involvement as an aggregate variable is discussed.

7.3.1 People Involvement – Its Components

This thesis found that Executive Commitment is positively associated with Organisational Performance. Companies who have stronger leadership and commitment from their top management toward managing core processes will increase their business performance. This finding supports previous studies and anecdotal evidence in the literature (Huselid, 1995; Konovsky and Cropanzano, 1991; Mayer and Schoorman, 1992; Meyer and Allen, 1997; Moorman et al., 1993; Powell, 1995; Sager and Johnston, 1989).

This thesis also found that Employee Empowerment is positively associated with Organisational Performance. Companies that provide more authority to their employees to manage their work will increase their business performance. This supports studies and anecdotal evidence in the literature (Arthur, 1994; Denison, 1990; Hansen and Wernerfelt, 1989; Huselid, 1995; Kallenberg and Moody, 1994; Kizilos et al., 1994).

This thesis confirms that the relationships between the components of People Involvement and Organisational Performance known in US and UK studies, also hold in Australia.

This thesis also found that both Executive Commitment and Employee Empowerment have similar effects on Organisational Performance (close correlation coefficients). Stronger leadership and commitment from top management towards managing core processes and providing more authority to employees to manage their work have a similar impact on the performance of an organisation.

7.3.2 People Involvement – As an Aggregate Variable

This thesis found that the research hypothesis: People Involvement is positively associated with Organisational Performance. Companies who have stronger leadership and commitment from their top management toward managing core processes, and provide more authority to employees to manage their work tend to achieve better Organisational Performance. However, this relationship was not supported directly. The indirect effect occurs because People Involvement affects Process Alignment and Process Improvement Competency, which in turn affect Organisational Performance. The higher the involvement of people, the greater the synergy that is created between structure, strategy, IT and process, and the more successful on implementing process improvement programs, which in turn tends to increase business performance. To date, many studies have been conducted on the components of People Involvement (cited in section 7.3.1) and this thesis has confirmed these studies. No empirical evidence, however, was found in the literature to support the relationship between People Involvement and Organisational Performance at an aggregate level. This includes a lack of evidence for Australia's Top 1000 companies.

This thesis found that People Involvement affects Organisational Performance in two ways. These ways and explanations are depicted in Table 7.3.

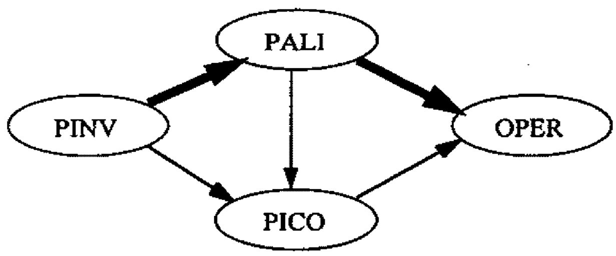
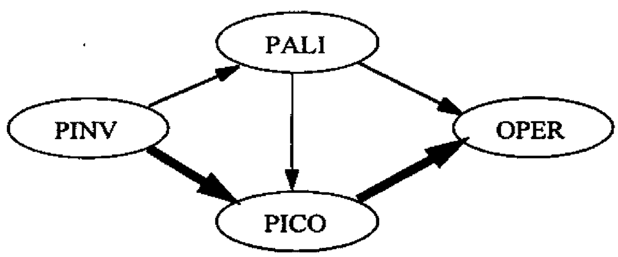
(1) People Involvement acts as an antecedent variable between Process Alignment and Organisational Performance Antecedent Variable 	***Explanation*** People Involvement affects Organisational Performance through Process Alignment. Higher People Involvement creates better Process Alignment which in turn improves Organisational Performance.
(2) People Involvement acts as an antecedent variable between Process Improvement Competency and Organisational Performance Antecedent Variable 	People Involvement affects Organisational Performance through Process Improvement Competency. Higher People Involvement creates better Process Improvement Competency which in turn improves Organisational Performance.

Table 7.3 Relationships between People Involvement and Organisational Performance

According to Teng et al. (1995), the social dimension of process change in reengineering projects was shown to be first and foremost, and technical process change would not be successful unless social change was. In other words, the technical components for process change are necessary but not sufficient. This thesis observed a similar effect for the success of Business Process Management. The social dimension of process management (top management commitment and employee empowerment) determines the success of the technical components of process management (identification of core processes, use of IT, strategy deployment etc).

7.4 Two-way Interactions of Process Alignment, Process Improvement Competency and People Involvement on Organisational Performance

This thesis found that the two-way interaction between Process Alignment and Process Improvement Competency is positively associated with Organisational Performance. To date, no empirical evidence has been found in the literature to support this finding.

High levels of both Process Alignment and Process Improvement Competency disproportionately impact the level of Organisational Performance. This means that a company that invests in both Process Alignment and Process Improvement Competency will achieve a far greater level of performance than if it invests in only one. For example, companies that attempt process reengineering but do not align new IT systems sufficiently with core processes will achieve far less a gain in performance compared to that companies do both. In a like manner, companies that undertake benchmarking but maintain their vertical structure will see less performance improvement than companies that change their structures to being more horizontal.

This thesis did not find a statistically significant interaction between Process Alignment and People Involvement on Organisational Performance. This was contrary to expectations. For example, companies that transform their structures from vertical to go horizontal without empowering their employees should create far less improvement than companies that do both. In a like manner, companies that align their strategies with core processes but have no commitment from the top management toward managing core processes should create far less improvement than companies that do both.

One plausible explanation for this finding is that the interaction between Process Alignment and People Involvement was suppressed. According to Cooper and Emory (1995), the relationship between two variables is suppressed when this relationship is blocked out or dampened by the third variable. Since People Involvement is positively associated with Process Improvement Competency, and since there is interaction between Process Alignment and Process Improvement Competency, there should be an interaction effect between People Involvement and Process Alignment. The reason that this interaction was not statistically significant was that it may have been suppressed by the interaction between Process Alignment and Process Improvement Competency.

This thesis also did not find a statistically significant interaction between People Involvement and Process Improvement Competency on Organisational Performance. This was contrary to expectations. For example, companies that undertake process reengineering without empowering employees should not achieve the same gains in performance compared to those companies who do both. In a like manner, companies that do benchmarking but do not gain commitment from the managers to institute process changes should not achieve the same gains in performance compared to companies that do both. This interaction may have been suppressed by the interaction between Process Alignment and Process Improvement Competency on Organisational Performance.

7.5 Process Management Capability

In this section, the relationship between Process Management Capability and business performance is discussed. Rummler and Brache (1995) described two levels of business performance: the organisational level of performance (Organisational Performance) and the process level of performance (Core Process Performance). In sub-section 7.5.1 the relationship between Process Management Capability and Organisational Performance is examined. In sub-section 7.5.2 the relationship between Process Management Capability and Core Process Performance is discussed.

7.5.1 Organisational Performance

This thesis found that Process Management Capability is positively associated with Organisational Performance.

This finding was expected because a higher level of Process Management Capability means greater synergies of structure, strategy and IT on process. Greater synergies will increase performance (Hall et al., 1993; Hinterhuber, 1995; Luftman et al., 1993; Ostroff and Smith, 1992; Powell and Dent-Micallef, 1997; Zairi, 1997). A higher level of Process Management Capability also means an increase in involvement of people at all levels and a higher competency in process improvement. Increased involvement of people leads to higher organisational performance (Arthur, 1994; Kallenberg and Moody, 1994; Meyer and Allen, 1997; Powell, 1995; Sager and Johnston, 1989). Increased competency in process improvement improves organisational performance (Brocka and Brocka, 1992; Davenport, 1993; Garvin, 1988; Harrington, 1995; Hunt, 1995; O'Neill and Sohal, 1998; Porter, 1993).

7.5.2 Core Process Performance

Core Process Performance measures the performance of each of the six core processes. Their names are adapted from the International Benchmarking Clearinghouse (1995) and Arthur Andersen (1998). They are (1) the process for determining customer needs; (2) the process for monitoring changes in customer expectations; (3) the process for designing new products and services; (4) the process for providing products and services to customers; (5) the process for providing after-sales services; and (6) the process for billing customers.

According to Armistead (1996), Carlyle (1990) and DeToro and McCabe (1997), a higher level of Process Management Capability increases a company's focus on customers. In the following, the relationship between Process Management Capability and the performance of each core process is discussed.

(1) Process for determining customer needs

This thesis found that Process Management Capability is positively associated with the performance of the process for determining customer needs.

One plausible explanation for this finding is that companies who know their customers better are likely to have more effective processes for determining customer needs. Therefore, Process Management Capability is positively associated with the performance of the process for determining customer needs.

(2) Process for monitoring changes in customer expectations

This thesis also found that Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations.

One plausible explanation for this finding is that companies who know their customer better, are likely to have better processes for monitoring changes in customer expectations. Therefore, Process Management Capability is positively associated with the performance of the process for monitoring changes in customer expectations.

(3) Process for designing new products and services

This thesis also found that Process Management Capability is positively associated with the performance of the process for designing new products and services.

One plausible explanation for this finding is that companies who know their customer better, are likely to understand the service and product needs of their customers. This knowledge would create better design processes. Therefore, Process Management Capability is positively associated with the performance of the process for designing new products and services.

(4) Process for providing products and services to customers

This thesis found that Process Management Capability is positively associated with the performance of the process for providing products and services to customers.

One plausible explanation for this finding is that companies who know their customer requirements better, are more likely to meet their requirements through their provisioning processes. Therefore, Process Management Capability is positively associated with the performance of the process for providing products and services to customers.

(5) Process for providing after-sales services.

This thesis also found that Process Management Capability is positively associated with the performance of the process for providing after-sales services.

One plausible explanation for this finding is that companies who know their customers better, are more likely to have more effective processes for solving customer problems. Therefore, Process Management Capability is positively associated with the performance of the process for providing after-sales services.

(6) Process for billing customers

This thesis found that Process Management Capability is positively associated with the performance of the process for billing customers.

One plausible explanation for this finding is that companies who know their customers better, are likely to bill the customer correctly (e.g. right amount, right price, and right customer details). Therefore, Process Management Capability is positively associated with the performance of the process for billing customers.

7.6 Summary

1. All of the three components of Process Alignment (namely Horizontalism, Strategy Alignment and IT Alignment) are positively associated with Organisational Performance. This thesis confirms that the relationship between Process Alignment at component level and Organisational Performance, which holds true overseas, also holds for Australia's Top 1000 companies. This thesis also found that Process Alignment at an aggregate level is positively associated with Organisational Performance. This is a new result.

2. All of the three components of Process Improvement Competency (namely Continuous Improvement Competency, Process Reengineering Competency, and Benchmarking Competency) are positively associated with Organisational Performance. This thesis confirms that the relationship between Process Improvement Competency at the component level and Organisational Performance, which holds true overseas, also holds for Australia's Top 1000 companies. This thesis also found that Process Improvement Competency at an aggregate level is positively associated with Organisational Performance. This confirms existing literature.

3. Both components of People Involvement (namely Executive Commitment and Employee Empowerment) are positively associated with Organisational Performance. This thesis confirms that the relationship between People Involvement at component level and Organisational Performance, which holds true overseas, also holds for Australia's Top 1000 companies. While People Involvement at an aggregate level is positively associated with Organisational Performance, the result is not supported directly. It was, however, supported indirectly. The indirect effect occurs because People Involvement affects Process Alignment and Process Improvement Competency, which in turn affect Organisational Performance. This is a new result.

4. This thesis found that the two-way interaction between Process Alignment and Process Improvement Competency is positively associated with Organisational Performance. This thesis did not find a statistically significant interaction between Process Alignment and People Involvement on Organisational

Performance. This thesis also did not find a statistically significant interaction between People Involvement and Process Improvement Competency on Organisational Performance. Both interaction effects were expected. The reason they did not materialise was that their effects were suppressed by other interaction effects.

5. This thesis found that Process Management Capability is positively associated with Organisational Performance and the performance of each of six core processes.

CHAPTER 8

CONCLUSIONS

The aims of this chapter are 1) to summarise the research, and 2) to discuss the limitations, contributions, and implications of this thesis. This chapter consists of five sections. In section 8.1, the summary of the research is provided. In sections 8.2 to 8.5, the limitations of the research, the contributions of this thesis to Business Process Management theory, the implications of this thesis for management practice and the directions for future research, are discussed.

8.1 Summary of the Research

Since the mid-80's, the intensity of business competition has increased significantly. Many companies have been forced to search for new ways to gain competitive advantage. When an organisation faces an increase in competition, it can respond in a number of ways: lower prices, increased advertising expenditure, new products and services, and cost cutting are some options. One or several of these may restore its profitability and market share in the short term. However, if competition is relentless and it cannot respond adequately for the long-term, sooner or later it will be forced to look internally at the way it manages its core processes.

If the organisation has been operating with a silo inward-looking approach where work is divided, controlled, protected and resourced along functional lines, it is likely that it will question whether it is sufficiently customer-focused. If the answer is no, it will probably have a culture where innovation is suppressed because conformance to functional goals overrides the need to create value for the customer. Creating value through a disciplined and structured approach to process management is the essence of BPM. Under BPM, managers will coach and design rather than supervise and control. Employees will be process performers rather than task workers with a broad understanding of how processes create value.

If the organisation decides to 'go horizontal' and adopt BPM as its style of management, will it improve its performance? This is the essence of the research hypotheses addressed in this thesis. Perception data from the leaders of Australia's Top 1000 companies suggests the answer is yes, and the more they follow the basic tenets of BPM, the better their companies will perform.

This thesis suggests the three basic tenets of BPM affect performance in the following manner:

Tenet 1: The willingness to create synergies between organisational structure, strategic management, IT systems and core processes.

Aligning structure and core processes

Organisational structure, which allocates reporting relationships and levels of authority, should be empathetic to the need to satisfy customers. Structure should not impede the operation of, and improvements to, core processes. A company adopting

BPM will need to question whether its structure needs to change or whether its present form is sufficiently cohesive to support a horizontal style of management. If it needs to alter its structure, a likely change is towards a structure based on core process teams that are responsible for the end-to-end work that deliver products and services to the customer. Studies in the US and UK found that companies whose management structure was more supportive of the coordination of activities across functions, tended to achieve better performance. This thesis confirms this relationship also holds true in Australia, at least for Australia's Top 1000 companies.

Aligning IT and core processes

The advancement of IT has created entirely new management approaches to information systems. Enterprise Resource Planning products such as SAP and PeopleSoft are becoming more popular in Australia. IT is enabling seamless linkages between sub-processes and is disseminating information among departments without barriers. IT is an important enabler of changes to core processes. It allows the smooth integration of business functions at all levels in an organisation. Studies in the US and UK found that companies whose IT systems more supportive of the end-to-end information needs of core processes, tended to achieve better performance. This thesis confirms this relationship also holds true in Australia, again at least for Australia's Top 1000 companies.

Aligning strategy and core processes

Organisations can pursue the creation of strategy from two perspectives: the market-based view and resource-based view. The market-based view suggests that organisations utilise the competitive advantage inherent in the distinctiveness of their value chains (substantially, their core processes) to find new market opportunities. The resource-based view suggests organisations use their core competencies to transform their existing range of products and services and enter new markets to seek new opportunities. These core competencies are embedded in their core processes and if distinctive, make them unique and difficult for competitors to imitate.

Understanding what an organisation's core processes are and where and why they differ form competitor's core processes are essential to the creation of strategy, whether it be from a market-based or resource-based perspective. Once strategy is established it should be deployed along core process lines so that functional action plans containing strategy-critical activities are aligned and resourced. Studies in the US and UK found that companies who create and implement strategy via core processes tend to achieve better performance. This thesis confirms this relationship also holds true in Australia, again at least for Australia's Top 1000 companies.

Tenet 2: The successful adoption of disciplined approaches to process improvement.

Organisations adopting a BPM style of management will need to be competent in small and large-scale process change. Failures in Continuous Improvement, Process Reengineering and Benchmarking are likely to act as a setback to the long-term viability of a horizontal management style. Failed process improvement initiatives reduce confidence that core process management works. Studies in the US, UK and Australia found that companies will increase their performance if they more successfully a) pursue incremental improvement programs, b) undertake radical change programs, c) adopt best practice. This thesis confirms these relationships.

Tenet 3: The involvement of people at all levels in the management of core processes.

Involvement of people at all levels is critical for Business Process Management. Top management involvement provides strong leadership that contributes toward integrating and co-ordinating core processes. Top management should proactively develop competencies and create competitive advantage in the context of a company's core processes. Empowering employees increases motivation, commitment and creativity. When employees are empowered, they find better ways to manage core processes. Studies in the US, UK and Australia found that companies tend to achieve better performance when they a) have stronger leadership and commitment from top management toward managing core processes, and b) provide more authority to employees to manage their work. This thesis confirms these relationships.

Other important findings of this thesis are:

1 *This thesis constructed the mechanism that relates the basic tenets of BPM to business performance.* This mechanism is prescribed in Figure 8.1 below:

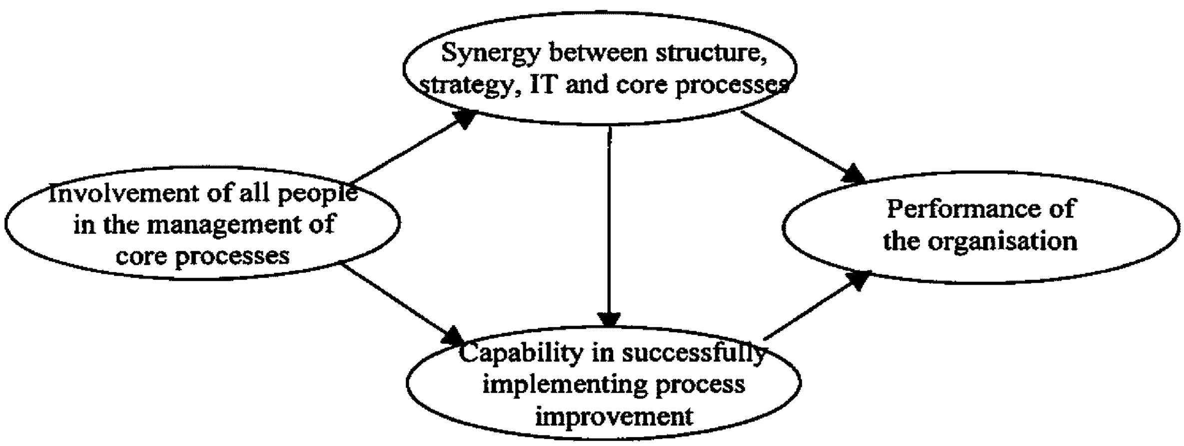


Figure 8.1 BPM mechanism

The mechanism has important implications. First, it demonstrate that leadership, motivation and empowerment are fundamental drivers of performance. This is consistent with the widely-held view that people are a company's only true source of competitive advantage. More specifically, this thesis found that the effect of investing in people and commitment from the top had a direct influence on the efficient and effective operation of core processes. The 'people factor' also enables greater synergies between structure, strategy, IT and core processes. Motivated and involved people produce the ideas and energy needed to align the elements of an organisation (structure, strategy and IT) with its pipelines to the customer. The thesis shows such alignment will not happen by itself. It needs to be led from the top and actively solicit contributions from front-line employees.

Working on the 'people factor' will also give organisations a better chance of success in Continuous Improvement, Process Reengineering and Benchmarking. Success in process improvement initiatives, an important driver of organisational performance, is not only influenced by the depth of people involvement but by the synergy they create between structure, strategy, IT and core processes. This synergy at a macro level tends to be a cause of success in process improvement initiatives rather than an effect. This is evidenced by the direction of the arrow from synergy to capability in the above model. The relationship suggests that when the correct infrastructure is established prior to undertaking Continuous Improvement, Process Reengineering or Benchmarking, namely: (i) the organisational structure supports process improvement, (ii) process improvement has a strategic input, and (iii) IT systems support the information requirements of core processes, then the chances of success are increased significantly. Increased competency in process improvement then leads to increased business performance.

The mechanism describing the relationship between the tenets of BPM and organisational performance has not been empirically developed in the literature. The mechanism developed in this thesis is a new contribution to BPM.

2 *This thesis investigated the two-way interaction effects between the three basic tenets of BPM: people involvement, synergy of structure, strategy, IT and core processes, and process improvement capability.*

The above model shows the fundamental importance of the 'people factor'. Yet greater synergy between structure, strategy, IT and core processes, and higher success rates in process improvement initiatives are the result of more than an investment in human capital. Financial resources to purchase IT systems, employ consultants, fund best practice site visits, modernise plant and equipment, purchase quality supplies and fund training and development initiatives, are also important in making a BPM style of management work successfully.

This thesis showed that if there is both an investment in human endeavour and sufficient financial resources to fund the infrastructure changes needed to support BPM, the company will be much better off than if it invests in one but not the other. Although the interaction effects, while statistically significant, are not easily quantifiable in terms of their cost-benefits, this thesis empirically demonstrated that a single-minded solution directed at involving people without financial resources or throwing money at a BPM change program without people involvement will suboptimise the level of organisational improvement. This thesis therefore strengthens, through empirical evidence, the state of knowledge on the role of resource drivers of organisational performance.

3 The more companies embrace the tenets of BPM, the better individual core processes perform.

The six core processes studied in this thesis were (1) the process for determining customer needs; (2) the process for monitoring changes in customer expectations; (3) the process for designing new products and services; (4) the process for providing products and services to customers; (5) the process for providing after-sales services; and (6) the process for billing customers. Not all the surveyed companies performed each core process. Each of these core processes is cross-functional; each depends upon information or work-in-progress being channeled between internal and external customers. Whichever core processes were examined, the result was similar; greater capability in adopting a BPM style management enhanced performance at the core process level. The empirical study of performance at the core process level is a new result.

4 The state of BPM in Australia's Top 1000 companies

Much of this thesis has concentrated on developing a research model, operationalising its constructs and variables, and testing hypotheses. In collecting the data for these aims, it has been possible to also describe the level of adoption of the tenets of BPM by Australia's Top 1000 companies. The thesis has been able to shed light on the critical question – to what extent have Australia's Top 1000 companies adopted a customer-focused and disciplined approach to managing their core processes?

Business Process Management as a label is not in common use in industry. Although companies refer to process owners, core processes, process teams, process measures and the like, their collective framework, BPM, tends to be a term used by academicians not practicing managers. The question – to what extent does your company adopt BPM? – could not be asked directly. Instead, the state of BPM in Australia's Top 1000 companies was inferred from questions relating to the three tenets of BPM: people involvement, synergy between structure, strategy, IT and core processes, and process improvement capability.

This thesis found that for Australia's Top 1000 companies:

(i) They needed to do more work on designing organisational structures that were more empathetic to the efficient and effective operation of their core processes.

(ii) They were adept at building and deploying strategies that considered their core processes.

(iii) While the alignment between IT and the information needs of core processes was generally good, there was still some room for improvement given the importance of IT in running a modern well-performing enterprise.

(iv) They were better at Continuous Improvement than Process Reengineering and Benchmarking. This was expected. Radical or quantum change efforts prove more difficult than small step change. Overall the results of process improvement initiatives, while not spectacular, were reasonably encouraging.

(v) The level of leadership and bottom-up involvement, whilst encouraging, still needed increased attention. This is particularly the case given the pay-off in organisational performance from 'people factor' improvements and their impact on synergy of organisational elements and process improvement capability.

This thesis demonstrated that BPM is practiced to at least a moderate extent in Australia's Top 1000 companies. Although more effort is needed, the results indicate that the companies are customer-focused and are willing to invest in the management of their core processes with the expectation of achieving increased performance.

8.2 Limitations of the Research

Like any other study, this thesis suffers from some limitations that need to be discussed. In the following, these limitations are presented and discussed.

In the survey, several questionnaire items asked the respondents to recall earlier events: for example, past process improvement initiatives. This may increase non-random error as respondents may be unsure of the actual situation. According to Carmines and Zeller (1979), non-random errors produce systematic bias on the results of a study and limit the ability to draw general conclusions.

This thesis relied on perception data based on five-point Likert scales. This may cause a problem with central tendency. According to Cooper and Emory (1995), central tendency reflects the reluctance of the respondent to provide an extreme judgement.

The problem of central tendency may limit the ability to draw general conclusions from the results. The data, being perception-based, may also not reflect reality.

Other limitations of this thesis may arise from the research design. This thesis is a cross-sectional survey, uses a single key informant and the population is the top 1000 companies. Each attribute may potentially limit the findings. A cross-sectional survey with a single key informant is only a snapshot of a dynamic that evolves over time. Interpretation of any result from a single survey, especially when studying a complex business phenomenon such as BPM, should be done with caution. The population of this thesis is the top 1000 Australian companies; therefore, the findings may be limited to the top 1000 Australian companies.

Business Process Management is a complex phenomenon and there is the possibility of overlooking some relevant variables because the literature has not identified them to date. Possibly a different set of variables or more variables would yield a more satisfactory model than the models developed in this thesis. The possibility of inadequate operationalisation of the variables may also reduce the generalisation of the findings.

In spite of substantial evidence presented on the reliability and validity of the measurement instrument, caution should be exercised when interpreting results. Claims of causality are risky as relationships between variables were examined in statistical terms. Correlation between variables does not imply causality. The results of the two-way interaction between PALI, PICO, PINV to OPER were not conclusive and limit the generalisability of the findings.

External validity is the ability to generalise a particular finding across different measures, settings, and populations (Cook and Campbell, 1979; Mitchell, 1985). This thesis did not seek external validity of the instrument. External validity was outside the scope of the research, which targeted only the top 1000 Australia companies.

8.3 Other Contributions of the Research

Despite the above limitations, this thesis contributes to a better understanding of the field of Business Process Management. This thesis has been able to: (1) identify gaps in current empirical studies; (2) develop new measurement scales; (3) build a testable model based on a systematic examination of the literature; and (4) develop and empirically investigate research hypotheses. The theoretical development of the model, the empirical data collected, and the findings of this thesis all add to the existing body of knowledge in Business Process Management.

Thirteen research hypotheses were empirically tested. This thesis makes a significant contribution because it empirically tests many scattered opinions and single case evidence about Business Process Management. The literature in Business Process Management has suffered from insufficient rigor. This thesis employed a rigorous data collection methodology. Variables were validated by systematically applying factor analysis. The reliability and validity of the measurement instrument was tested. These are all factors that contribute towards a more scientific analysis of BPM.

8.4 Implications for Practice

The findings of this thesis have implications for practitioners. It provides evidence that better performance can be achieved through the adoption of Business Process Management.

This thesis recommends that companies should spend time and resources on developing synergies between structure, strategy, IT and core processes. It recommends that the organisational structure should support the coordination of activities across functions. Companies should invest in IT systems that are built around the information needs of core processes. Companies should also raise the importance of understanding the links between core processes and the creation and implementation of strategy.

This thesis recommends companies should pay more attention to their process improvement initiatives. This includes providing resources and support. The pay-off will be increased organisational performance.

This thesis recommends companies continue their investment in the 'people factor'. Stronger leadership and commitment from top management towards managing core processes, and employee empowerment create performance improvement.

If a company wants to achieve a quantum leap in performance, all of the above recommendations need to be applied simultaneously.

8.5 Directions for Future Research

This thesis provides several useful opportunities for future research. The implications for future research are described in the following:

(1) The proposed research model is by no means complete. This research model could be refined to include other dimensions such as:

- *Level of competition.* How the nature of competition affects the performance of core processes.
- *Allocation of company resources.* How the allocation of financial resources within a BPM context affects performance.
- *Timing of process improvement initiatives.* How the sequence of process improvement initiatives affect performance.
- *Capability of support processes.* How the capability of support processes, such as role of systems, may affects performance.

Future studies might attempt to extend the research model by adding a different set of independent variables based on the above dimensions.

(2) Examination of the relationship of the thirteen research hypotheses in specific industries is suggested. Results may be more significant in some industries than others. Replications of this research for small and medium companies would also be useful. Replications of this research in different countries would be useful to understand whether the findings of this thesis hold in other cultures.

(3) The results of the two-way interactions between PALI, PICO, PINV to OPER were not conclusive. Research involving triangulation through company case studies is needed to shed more light on the interpretation of the two-way interactions.

(4) Process Management Capability measures the degree to which a company adopts BPM. Future research might extend this thesis to satisfy the following objectives:

(a) To broaden the research by examining the relationship between Process Management Capability and Economic Value-Added (EVA) of companies. EVA is the after-tax cash flow a firm derives from its invested capital less the cost of that capital. EVA is the best predictor of shareholder value (Keen, 1997). The relationship between Process Management Capability and the shareholder value of a firm would be a useful research project.

(b) To investigate the relationship between successfully implementing the Balanced Scorecard and Process Management Capability. According to Kaplan and Norton (1996), the Balanced Scorecard should translate a business unit's mission and strategy into tangible objectives and measures. It should help companies better focus on the coordination of activities across functions and increase their understanding of the relationship between core processes and the creation and implementation of strategy. The relationship between successfully implementing the Balanced Scorecard and Process Management Capability would be a useful research project.

(c) To examine the impact of Process Management Capability on the success rate of E-Business. E-Business is radically changing the nature of business processes and is a relatively fertile ground for research. Examining whether an organisation historically good at managing core processes, will also be successful in E-Business applications would be a useful research project.

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Appendix A Preliminary Opinion Questionnaire

To Whom It May Concern,

My name is Richard Hung, a Ph.D. student under the supervision of Dr Paul Walsh at the AGSM Newtown campus. As part of my research, I wish to distribute a questionnaire, which will address the following issues relating to:

- *Overall Organization Performance*. For example, the organization's productivity, competitive position, or overall quality.
- *Managing Organization*. For example, change in organization structure, strategic planning and technology-process alignment.
- *Top Management Commitment and Employee Empowerment*.
- *Competency of Process Improvement Programs*. For example, continuous improvement, process reengineering, and benchmarking.

In this preliminary test, would you please assist me in answering the following three questions.

1. What is the position title of the person(s) within your organization that is most able to fill in the questionnaire?

__ Chief Executive Officer	__ Strategic Director	__ Business Development Mgr
__ Chief Finance Officer	__ Finance Director	__ Finance Manager
__ Chief Operation Officer	__ Human Resources Director	__ HR Manager
__ Managing Director	__ Operation Director	__ Operation Manager
__ Deputy Managing Director	__ Quality Director	__ Quality Manager
__ General Manager	__ Others, please specify ______________________	

2. What is the highest educational level attained by 'this person(s)" in your organization?

__ High School	__ TAFE Graduate	__ Bachelor Degree
__ Master Degree	__ Ph.D. Degree	

3 What is your company's primary industry?

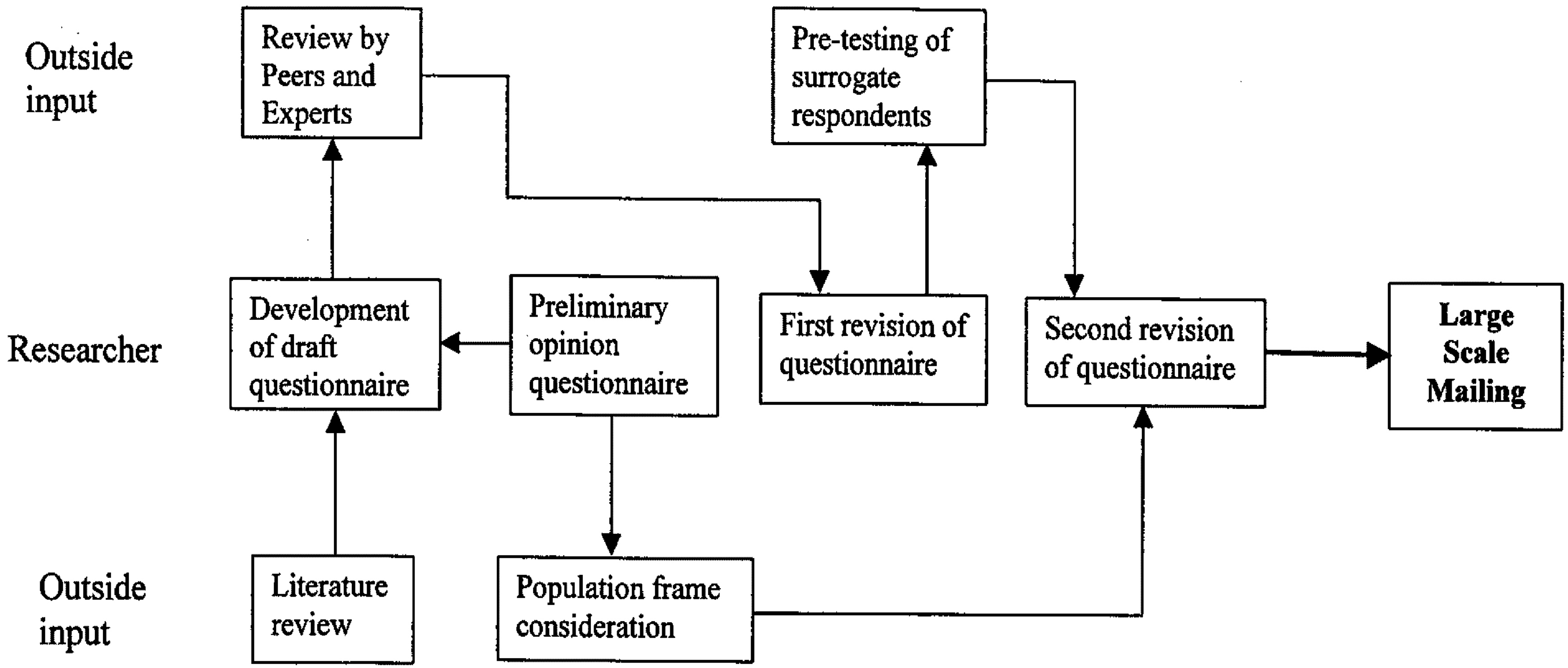
__ Banks & financial services	__ Paper, Packaging
__ Chemicals	__ Property Trusts
__ Construction & Building Materials	__ Retail
__ Energy	__ Telecommunications & IT
__ Food, Beverages and tobacco	__ Tourism, Leisure
__ Gold and other metals	__ Transport
__ Healthcare, biotechnology	__ Other Manufacturing, please specify ______
__ Insurance	__ Other Services, please Specify ___________

Your participation is very much appreciated. Thank you very much for your time.

Best regards,

Richard Y Hung

Appendix B Framework for the Questionnaire Design



Appendix C Definition of variables and terms

Term	Definition
Benchmarking	a continuous and systematic improvement process based on evaluating and adapting the products, services, and processes of a company that represent best practice
Benchmarking Competency	the extent of a company's ability to successfully implement Benchmarking
Business process	a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer
Business Process Management (BPM)	an integrated management approach and set of practices based on core processes that emphasises (1) alignment of organisational structure, strategy, and information technology on processes; (2) significant people involvement at senior and operation levels; and (3) capability in process improvement
Continuous Improvement	the creation of small-step change in work processes
Continuous Improvement Competency	the extent of a company's capability in successfully implementing Continuous Improvement programs
Core process	process that is critical to customer satisfaction and has a high impact on the strategic goals and objectives of the company
Core Process Performance	the extent to which an organisation ensures that its core processes meet customer needs and work efficiently
Executive Commitment	the extent of commitment of top executive management towards managing core processes
Employee Empowerment	the extent to which a company provides the authority, environment and facilities needed by employees to adequately manage business processes
Horizontalism	organisational transformation from a vertical to a horizontal structure that required to build and sustain a commitment to meeting and exceeding customer expectations
IT Alignment	the extent of the alignment of IT with the information needs of core processes
Organisational Performance	performance in a holistic way, according to the expectations of external stakeholders
People Involvement (PINV)	the extent of the involvement of people at all levels in the management of core processes

Term	Definition
Process Alignment (PALI)	the alignment between organisational structure and processes, information technology and processes, and the company's strategy and processes
Process Improvement Competency (PICO)	the extent to which a company is successful in implementing process improvement initiatives
Process Management Capability (PMC)	the extent to which an organisation embrace the three tenets of BPM (Process Alignment, People Involvement and Process Improvement Competency)
Process Reengineering	the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed
Reengineering Competency	the extent of the company's capability in successfully implementing Process Reengineering
Strategy Alignment	the extent to which the strategic plan integrates related activities across functional entities and is based around core processes

Appendix D Questionnaire package

Appendix D.1 Cover letter

Richard Hung
Ph.D. Candidate
Email: richardh@agsm.edu.au

«SALUTATION» «FNAME» «SURNAME»
«TITLE»
«COMPANY»

XXth August 1999

Dear «FNAME»,

I am presently undertaking a PhD degree at the Australian Graduate School of Management (AGSM). As part of my research I have prepared a questionnaire. I am writing to request your participation.

The purpose of this survey is to improve our understanding of the relationship between the ways companies manage their business processes and the way they perform. Factors that influence this relationship include strategic coordination, technology alignment, people management, and improvement programs.

You will find attached a questionnaire on "The Effect of Different Styles of Managing Business Processes on Organisational Performance". This questionnaire is being sent to the Top 1000 organisations in Australia.

The questionnaire should take **no more than 15 minutes** to complete. Most of the questions can be answered by ticking a box or circling a number and will not require you to refer to any detailed records. We hope that you will reply to this questionnaire yourself, or bring it to the attention of another executive who could assist in completing it.

I assure you that your individual responses will be held in the **strictest of confidence**. Your answers will be combined with those of other respondents and presented only in summary form in my PhD thesis. Please return the completed questionnaire in the enclosed postage-paid envelope. In appreciation of your participation, if you attach a business card, I will **send you a summary of the research findings**.

I look forward to receiving your completed questionnaire and thank you in advance for your time and effort. If you have any questions or concerns please feel free to contact me by e-mail.

Yours sincerely,

Richard Hung
PhD Candidate

Supervisor: Dr Paul Walsh
Academic Director MBA Program
Newtown Campus

Appendix D.2 Questionnaire

Survey on:
The Effect of Different Styles of Managing Business Processes On Organisational Performance

A research project conducted by:

Richard Hung

Ph.D. candidate

Australian Graduate School of Management

(AGSM)

The AGSM is a School of both

The University of Sydney and The University of New South Wales

e-mail address:

sthung@gsb.usyd.edu.au

Directions for the questionnaire:

- This questionnaire is addressed to the person who understands how the company's business processes are managed and who knows how the company is performing. Pre-research results indicate that the CEO or Managing director is usually that person.
- In this questionnaire, the term organisation refers to a single corporation, a business unit, or a subsidiary of a holding company.
- The questionnaire should take **no more than 15 minutes** to complete. Please respond to this questionnaire yourself or bring it to the attention of another executive who could assist in completing it.
- This is **an anonymous survey**. To receive a copy of summary of the research findings, please attach a business card below.

Attach
Business Card
Here

Part 1: General Information

Please answer the question or tick the response that describes your organisation

1. What is your position/title in your organisation? ______________________

2. What is your organisation's primary industry? (Check One)

__ Banks and Financial Services
__ Construction and Property Services
__ Food, Beverage and Tobacco
__ Media, Sport and Leisure
__ Petrol, Coal and Chemical Products
__ Other Manufacturing, please specify ____________
__ Other Services, please specify ________________
__ Business Services
__ Energy and Utilities
__ Mining and Metals
__ Transport and Logistics
__ IT and Communications
__ Agriculture
__ Health Services
__ Insurance
__ Retail
__ Wholesaling

3. How many years has your organisation been in business? ______________________

4. How many employees did your organisation have in 1998?

Full-time employees ___________ Part-time employees ___________

5. What was your organisation's 1998 sales volume (in AUD$ Million)? _______________

6. Has your organisation conducted Outsourcing?

(_)Yes, -- What areas in your organisation are Outsourced? (<u>You can indicate more than one item</u>)

__ IT Outsourcing
__ Warehousing Outsourcing
__ Call Centre Outsourcing
__ Production Outsourcing
__ Market Research Outsourcing
__ Procurement Outsourcing
__ Finance/Accounting Outsourcing
__ Human Resource Outsourcing
__ Advertising Outsourcing
__ Others, please specify ____________________

(_)No, -- Do you intend to undertake Outsourcing in the next 2 years? (_)Yes (_)No

7. Does your organisation have a Balanced Scorecard in place?

(_) Does not know what a Balanced Scorecard is. -- *<u>Please go directly to Part 2 (page 2)</u>*

(_) Yes, -- To what extent has the Balanced Scorecard improved the performance of your organisation?

(_)Too soon to tell (_)None (_)Little (_)Moderate (_)Major

(_) No, -- Do you intend to use a Balanced Scorecard in the next 2 years?

(_)Yes (_)No

Part2: Managing Your Organisation

1. Please assess your organisation in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

For each statement, please circle the most appropriate response.

a	There are high barriers between departments	SD	D	N	A	SA
b	We make frequent use of process teams	SD	D	N	A	SA
c	Our cross-functional teams have more authority than departmental managers in making day-to-day decisions	SD	D	N	A	SA
d	Our response time satisfies customer needs	SD	D	N	A	SA
e	Horizontal communication is well practiced in our organisation	SD	D	N	A	SA
f	We have a flat organisational structure	SD	D	N	A	SA
g	We delegate managerial tasks to front-line staff	SD	D	N	A	SA

2. Please assess the use of technology in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

For each statement, please circle the most appropriate response

a	Our technology enables our business processes to perform well	SD	D	N	A	SA
b	Our technology is state-of-the-art	SD	D	N	A	SA
c	The amount of data shared by employees is increasing	SD	D	N	A	SA
d	Information Technology is very important to the improvement of our business processes	SD	D	N	A	SA
e	Our Information Technology systems are well integrated across functional units	SD	D	N	A	SA

3. This section required you to understand the term <u>Core Processes</u>. Core processes represent core business. They start by identifying opportunities, customer needs, purchase orders, and end by delivering products and services to external customers. They are critical to customer satisfaction and have a high impact on the strategic goals and objectives of the organisation. Examples of core processes include the attracting customers, developing new products, the supply chain, and customer relationship management.

Please assess the development of your company's strategic plan in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

For each statement, please circle the most appropriate response

a	We develop strategies based on customer needs	SD	D	N	A	SA
b	The management team has identified our core processes	SD	D	N	A	SA
c	Our core processes are an important input into our strategic plan	SD	D	N	A	SA
d	Our operational improvements have a direct impact on our ability to compete	SD	D	N	A	SA
e	We have sufficient measures to permit clear tracking of our performance	SD	D	N	A	SA
f	Our current strategic plan identifies the projects we actually undertake to improve our business processes	SD	D	N	A	SA
g	Our strategic planning process encourages information sharing and cross-functional cooperation	SD	D	N	A	SA

Part3: Top Management and Other Employees

1. Please assesses the commitment of top management in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

For each statement, please circle the most appropriate response

a	Top management has received adequate training in managing core processes	SD	D	N	A	SA
b	Top management has sufficient knowledge on how to manage core processes	SD	D	N	A	SA
c	Top management actively communicates to employees on how best to manage core processes	SD	D	N	A	SA
d	Top management expressly recognises the need to identify core processes	SD	D	N	A	SA
e	Top management allocates adequate resources to improve core processes	SD	D	N	A	SA

2. Please assess the level of employee empowerment in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

For each statement, please circle the most appropriate response

a	Employees are increasing their involvement in the way their work is planned	SD	D	N	A	SA
b	Employees are increasing their autonomy in making decisions that affect their work	SD	D	N	A	SA
c	Employees *are not given* the necessary resources to fix problems they encounter	SD	D	N	A	SA
d	Employees are encouraged to fix problems they encounter	SD	D	N	A	SA
e	Employees are interacting more with external customers	SD	D	N	A	SA

Part 4: Process Improvement Activities in Your Organisation

Part 4 examines the type of process improvement programs conducted in your organisation. These include Continuous Improvement programs, Process Reengineering programs, and Benchmarking programs.

Section 4A: Continuous Improvement Programs

A Continuous Improvement program is a systematic and formal program for ongoing process improvement at any level of process. It is typically implemented in the form of: Process Improvement Teams, Quality Improvement Teams, Quality Circles, and Employee Suggestion Schemes.

Section 4A-1: Continuous Improvement Initiatives

Based on the above description, has your company conducted Continuous Improvement programs?

( ) Yes, please continue to *Section 4A-2*

( ) No, -- Why not? (You can indicate more than one item)

( )No urgency ( )Results in too small a change

( )Insufficient resources ( )Others______________

-- Will you consider Continuous Improvement programs in the next 2 years?

( )Yes ( )No

-- *Please go directly to Section 4B (page 5)*

Section 4A-2: Continuous Improvement Capability

This section examines the Continuous Improvement programs conducted in your organisation. Please tick the appropriate answer.

1. How long has your organisation been undertaking Continuous Improvement programs?

( ) Less than 1 year, ( ) 1-2 years, ( ) 3-4 years,

( ) 5-7 years, ( ) More than 7 years

2. Please assess your Continuous Improvement programs in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree,

For each statement, circle the most appropriate response

a	We have increased the number of employees involved in Continuous Improvement programs in the last three years	SD	D	N	A	SA
b	The number of Continuous Improvement projects has increased annually in the last three years	SD	D	N	A	SA
c	We have a formal methodology in place to guide our Continuous Improvement programs	SD	D	N	A	SA
d	Our organisation will definitely continue with Continuous Improvement programs	SD	D	N	A	SA
e	Our experience with Continuous Improvement programs has generally been positive	SD	D	N	A	SA
f	Our Continuous Improvement programs contribute to bottom line improvement	SD	D	N	A	SA

Section 4B: Process Reengineering

Process Reengineering is a radical change in business processes to achieve dramatic improvements in critical performance areas including cost, quality, service, speed, responsiveness, and customer satisfaction. In general, the objective is more than 50 percent improvement within 1 to 3 years

Section 4B-1: Process Reengineering Initiatives

Based on the above description, has your company attempted Process Reengineering?

( ) Yes, please continue to *Section 4B-2*

( ) No, -- Why not? (<u>You can indicate more than one item</u>)

( )No urgency ( )Results in too drastic a change

( )Insufficient resources ( )Others________________

-- Will you consider to undertake Process Reengineering in the next 2 years?

( )Yes ( )No

-- *<u>Please go directly to Section 4C (page 6)</u>*

Section 4B-2: Process Reengineering Capability

This section examines the Process Reengineering programs conducted in your organisation. Please tick the appropriate answer.

1. How long has your organisation been undertaking Process Reengineering programs?

( ) Less than 1 year, ( ) 1-2 years, ( ) 3-4 years,

( ) 5- 7 years, ( ) More than 7 years

2. Please assess your Process Reengineering programs in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree,

For each statement, circle the most appropriate response

a	We have increased the number of employees involved in Process Reengineering programs in the last three years	SD	D	N	A	SA
b	The number of Process Reengineering projects has increased annually in the last three years	SD	D	N	A	SA
c	We *do not* have a formal methodology in place to guide our Process Reengineering programs	SD	D	N	A	SA
d	Our organisation will definitely continue with Process Reengineering programs	SD	D	N	A	SA
e	Our experience with Process Reengineering programs has generally been positive	SD	D	N	A	SA
f	Our Process Reengineering programs contribute to bottom line improvement	SD	D	N	A	SA

Section 4C: Benchmarking

Benchmarking is a continuous and systematic program for evaluating the products, services, and processes of organisations and modifying them to achieve best practice. It relies on external sources to provide best practices.

Section 4C-1: Benchmarking Initiatives

Based on the above description, has your company conducted Benchmarking?

( ) Yes, please continue to *Section 4C-2*

( ) No, -- Why not? (You can indicate more than one item)

( )No urgency ( )Difficult to find Benchmarking partner

( )Insufficient resources ( )Others ____________

-- Will you consider Benchmarking in the next 2 years?

( )Yes ( )No

-- *Please go directly to Part 5 (page 8)*

Section 4C-2: Benchmarking Capability

This section examines the Benchmarking programs conducted in your organisation. Please tick the appropriate answer.

1. How long has your organisation been undertaking Benchmarking?

( ) Less than 1 year, ( ) 1-2 years, ( ) 3-4 years,

( ) 5- 7 years, ( ) More than 7 years

2. Please assess your Benchmarking programs in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree,

For each statement, circle the most appropriate response

a	We have increased the number of employees involved in Benchmarking programs in the last three years	SD	D	N	A	SA
b	The number of Benchmarking projects has increased annually in the last three years	SD	D	N	A	SA
c	We have a formal methodology in place to guide our Benchmarking programs	SD	D	N	A	SA
d	Our organisation will definitely continue with Benchmarking programs	SD	D	N	A	SA
e	Our experience with Benchmarking programs has generally been positive	SD	D	N	A	SA
f	Our Benchmarking programs contribute to bottom line improvement	SD	D	N	A	SA

Part5: Business Performance

Business performance refers to financial and customer outcomes that are obtained from processes, products, and services. It consists of organisational performance and core process performance.

1 Please assess organisational performance in the following terms:

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree,

For each statement, circle the most appropriate response

a	Our organisation's competitive position has improved over the last two years	SD	D	N	A	SA
b	The productivity of our employees has increased over the last two years	SD	D	N	A	SA
c	Our organisation's profitability has increased over the last two years	SD	D	N	A	SA
d	The quality of our products and services *has not* improved over the last two years	SD	D	N	A	SA
e	Our average cost per unit of product or service has decreased over the last two years	SD	D	N	A	SA

2. Please rate how well the following core processes perform in your organisation.

For each statement, please circle the most appropriate response to indicate whether core process is:

Not Applicable = NA, Extremely Bad = EB, Bad = B, Neutral = N, Good = G, Extremely Good = EG.

a	The process for determining customer needs	NA	EB	B	N	G	EG
b	The process for monitoring changes in customer expectations	NA	EB	B	N	G	EG
c	The process for designing new products and services	NA	EB	B	N	G	EG
d	The process for providing products and services to customers	NA	EB	B	N	G	EG
e	The process for billing customers	NA	EB	B	N	G	EG
f	The process for providing after-sales service	NA	EB	B	N	G	EG

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

Please return the completed questionnaire in the self-addressed stamped envelope.

Appendix E Exploratory data analysis

Appendix E.1 Normality check of variables

(a) Stem and leaf plots

PALI (Process Alignment)

```
  Frequency          Stem & Leaf

    2.00 Extremes     (=<2.4)
     .00        2 .
    3.00        2 .  666
    8.00        2 .  88889999
    9.00        3 .  000000001
   16.00        3 .  2222222223333333
   42.00        3 .  444444444444444444444444455555555555555555
   38.00        3 .  66666666666666666666666677777777777777
   39.00        3 .  888888888888888888888888888888999999999
   44.00        4 .  00000000000000000000000001111111111111111111
   30.00        4 .  222222222222222222223333333333
   11.00        4 .  44444444555
    8.00        4 .  66667777
    1.00        4 .  8
```

PINV (People Involvement)

```
  Frequency          Stem & Leaf

    4.00 Extremes     (=<2.6)
    4.00        2 .  89
   15.00        3 .  0111111
   19.00        3 .  222333333
   31.00        3 .  444444555555555
   42.00        3 .  66666666667777777777
   54.00        3 .  888888888888899999999999999
   47.00        4 .  00000000001111111111111
   20.00        4 .  222222333
    8.00        4 .  445
    4.00        4 .  77
    6.00        4 .  88&
    1.00 Extremes     (>=5.0)
```

PICO (Process Improvement Competency)

```
  Frequency          Stem &  Leaf

    2.00 Extremes     (=<2.81)
    1.00       29 .  0
    3.00       30 .  049
    4.00       31 .  4499
    2.00       32 .  33
     .00       33 .
   12.00       34 .  222777777777
   14.00       35 .  22222227777777
    9.00       36 .  111111666
   12.00       37 .  111111111666
   18.00       38 .  000000005555555555
   17.00       39 .  00000000000005555
   21.00       40 .  000000044444444499999
    5.00       41 .  44999
    5.00       42 .  33888
    2.00       43 .  33
    2.00       44 .  27
    2.00       45 .  22
    2.00       46 .  66
    2.00       47 .  11
    4.00 Extremes     (>=4.81)
```

PALI*PINV (Interaction between Process Alignment and People Involvement)

```
 Frequency          Stem &  Leaf

     1.00 Extremes      (=<5.8)
     1.00         6 .  4
     3.00         7 .  679
     3.00         8 .  124
    10.00         9 .  2235667999
    11.00        10 .  01123345568
    20.00        11 .  01112222344577788889
    28.00        12 .  0000111233444455555677777888
    33.00        13 .  000011223333444555555566667888899
    33.00        14 .  000000001112222334445556667888999
    25.00        15 .  1223344455556677777778888
    32.00        16 .  00001111123333333456677777788999
    26.00        17 .  00001222344444446677889999
     9.00        18 .  112256799
     4.00        19 .  2358
     4.00        20 .  1148
     3.00        21 .  035
     2.00        22 .  34
     3.00 Extremes      (>=23.0)
```

PALI*PICO (Interaction between Process Alignment and Process Improvement Competency)

```
 Frequency          Stem &  Leaf

     1.00 Extremes      (=<7.0)
     3.00         8 .  359
      .00         9 .
     4.00        10 .  0045
    10.00        11 .  0024555689
    12.00        12 .  112455557889
    21.00        13 .  001111233345666677888
    14.00        14 .  00124445677899
    20.00        15 .  01122234444566688999
    19.00        16 .  0011233345566777888
    15.00        17 .  001122345667779
     5.00        18 .  44458
     5.00        19 .  35699
     3.00        20 .  258
      .00        21 .
     1.00        22 .  0
     2.00 Extremes      (>=23.0)
```

PINV*PICO (Interaction between People Involvement and Process Improvement Competency)

```
 Frequency          Stem &  Leaf

     1.00 Extremes      (=<7.6)
     1.00         9 .  7
     8.00        10 .  13448889
    10.00        11 .  0233566679
    11.00        12 .  35568888999
    18.00        13 .  133466666777788999
    22.00        14 .  0111223444566667888999
    26.00        15 .  11223333444444666666678899
    14.00        16 .  12223345567789
     8.00        17 .  01233447
     7.00        18 .  0114559
     3.00        19 .  149
     4.00        20 .  0144
     5.00 Extremes      (>=21.6)
```

OPER (Organizational Performance)

```
Frequency          Stem &  Leaf

  4.00 Extremes     (=<2.2)
   .00        2 .
  1.00        2 .  4
  2.00        2 .  66
  6.00        2 .  888888
  4.00        3 .  0000
  9.00        3 .  222222222
 19.00        3 .  4444444444444444444
 31.00        3 .  6666666666666666666666666666666
 38.00        3 .  88888888888888888888888888888888888888
 41.00        4 .  00000000000000000000000000000000000000000
 37.00        4 .  2222222222222222222222222222222222222
 20.00        4 .  44444444444444444444
 15.00        4 .  666666666666666
 13.00        4 .  8888888888888
 17.00        5 .  00000000000000000
```

PMC (Process Management Capability)

```
Frequency          Stem &  Leaf

  1.00 Extremes     (=<2.83)
  1.00       30 .  0
  3.00       31 .  058
  3.00       32 .  137
  5.00       33 .  67788
  6.00       34 .  012478
 11.00       35 .  33334666889
 11.00       36 .  03445567889
 12.00       37 .  001133459999
 13.00       38 .  0133446778999
 23.00       39 .  00013345555666677888999
 14.00       40 .  23345566667789
 11.00       41 .  00124556778
  7.00       42 .  0115689
  4.00       43 .  3345
  3.00       44 .  588
  2.00       45 .  15
  3.00       46 .  015
  2.00 Extremes     (>=4.77)
```

PDCN (The Process for Determining Customer Need)

```
Frequency          Stem &  Leaf

  1.00 Extremes     (=<1.0)
 11.00        2 .  000
   .00        2 .
 49.00        3 .  000000000000
   .00        3 .
171.00        4 .  000000000000000000000000000000000000000000
   .00        4 .
 28.00        5 .  0000000
```

MCCE (The Process for Monitoring Changes in Customer Expectations)

```
Frequency          Stem &  Leaf

  3.00 Extremes     (=<1.0)
 27.00        2 .  000000000
   .00        2 .
 82.00        3 .  000000000000000000000000000
   .00        3 .
122.00        4 .  00000000000000000000000000000000000000000
   .00        4 .
 22.00        5 .  0000000
```

DNPS (The Process for Designing New Products and Services)

```
Frequency         Stem &  Leaf

  5.00 Extremes    (=<1.0)
 17.00        2 .  000000
   .00        2 .
 94.00        3 .  0000000000000000000000000000000
   .00        3 .
120.00        4 .  0000000000000000000000000000000000000000
   .00        4 .
 20.00        5 .  0000000
```

PPSC (The Process for Providing Products and Services to Customers)

```
Frequency         Stem &  Leaf

  2.00 Extremes    (=<1.0)
  9.00        2 .  00
   .00        2 .
 49.00        3 .  000000000000
   .00        3 .
164.00        4 .  00000000000000000000000000000000000000000
   .00        4 .
 35.00        5 .  000000000
```

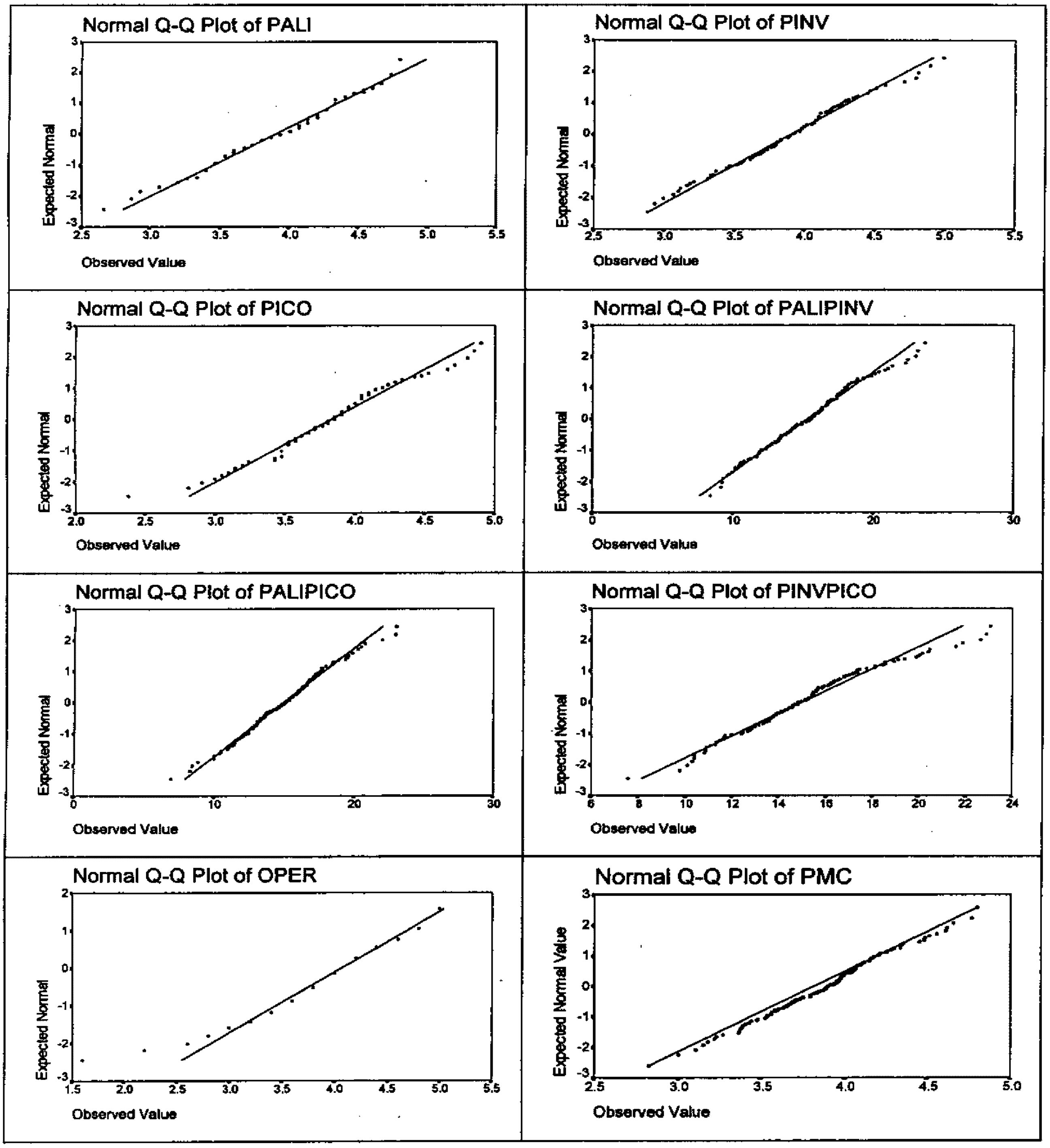
PBCU (The Process for Billing Customers)

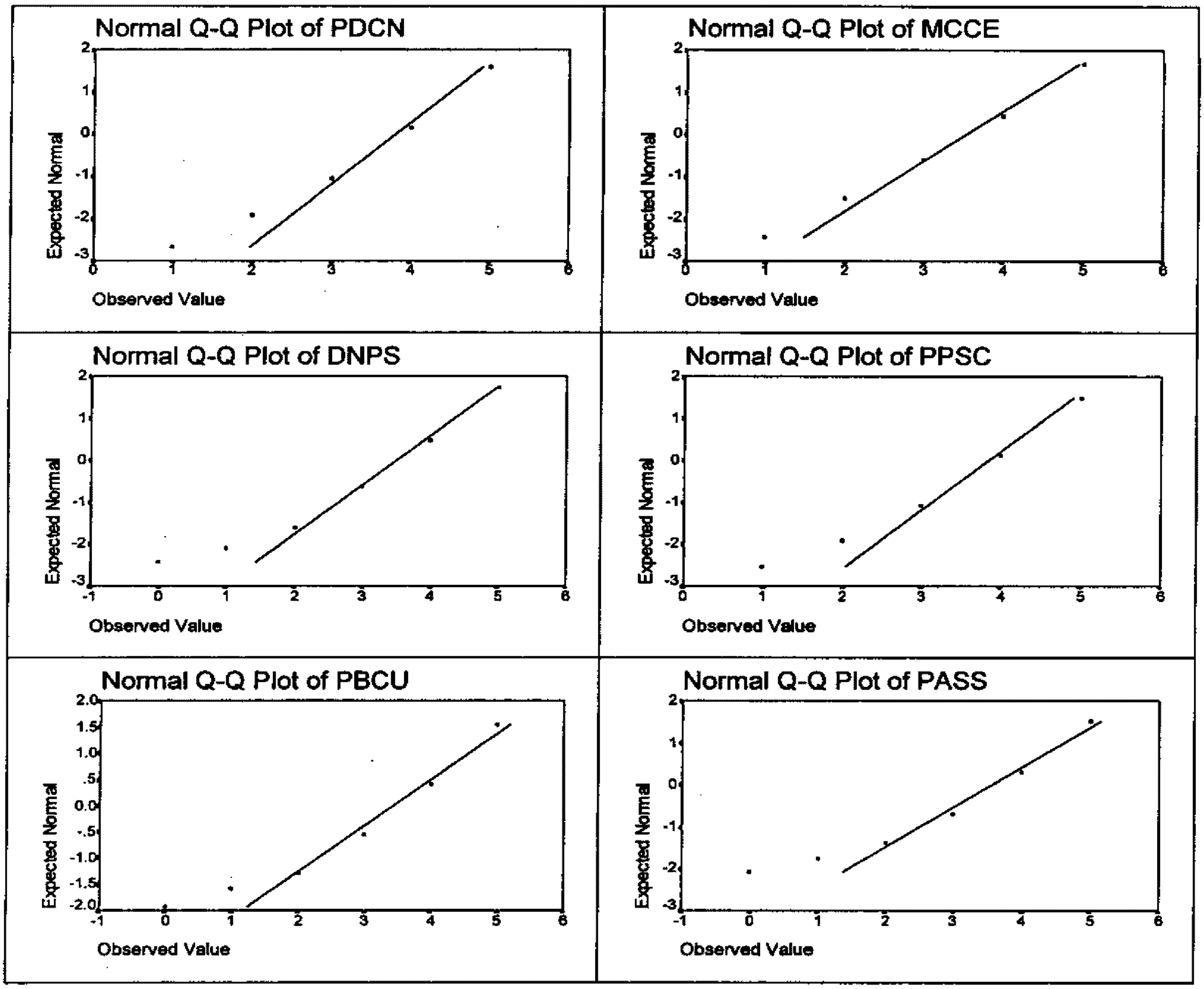
```
Frequency         Stem &  Leaf

 15.00 Extremes    (=<1.0)
 20.00        2 .  0000000
   .00        2 .
 78.00        3 .  00000000000000000000000000
   .00        3 .
114.00        4 .  00000000000000000000000000000000000000
   .00        4 .
 29.00        5 .  0000000000
```

PASS (The Process for Providing After-Sales Services)

```
Frequency         Stem &  Leaf

 11.00 Extremes    (=<1.0)
 20.00        2 .  0000000
   .00        2 .
 64.00        3 .  000000000000000000000
   .00        3 .
130.00        4 .  0000000000000000000000000000000000000000000
   .00        4 .
 31.00        5 .  0000000000
```

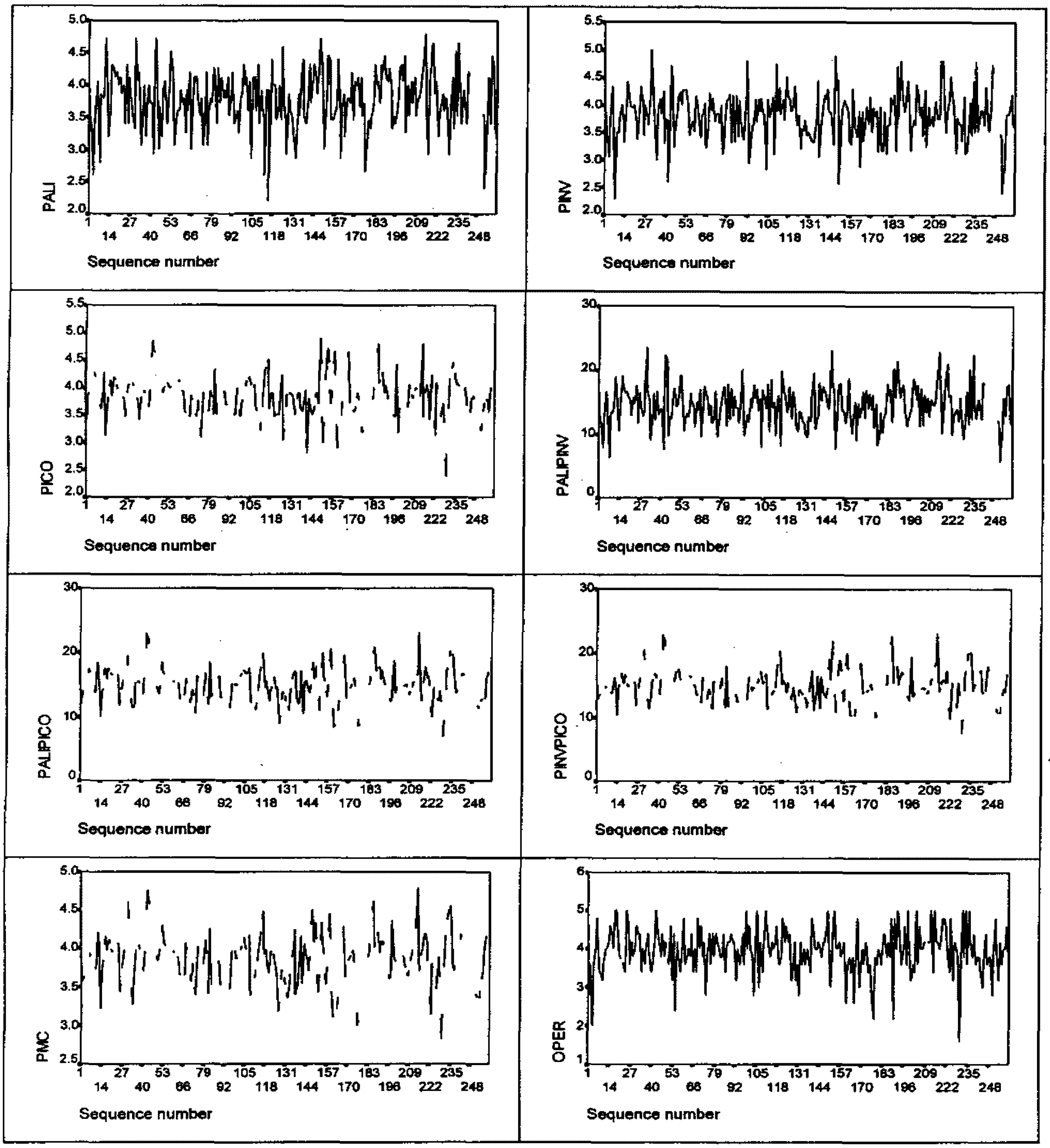
(b) Normal Q-Q plots

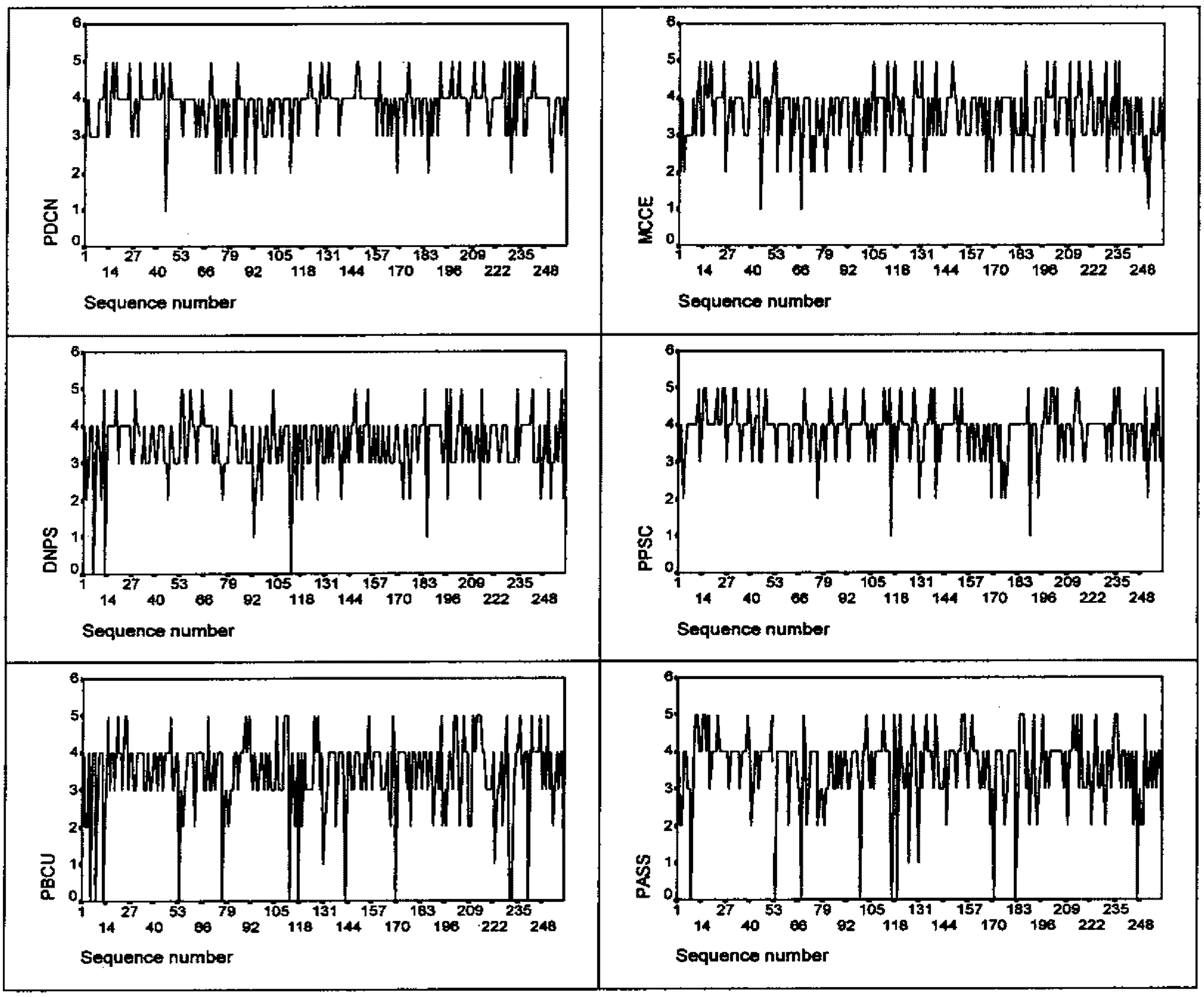



Normal Q-Q Plot of PDCN
Normal Q-Q Plot of MCCE
Normal Q-Q Plot of DNPS
Normal Q-Q Plot of PPSC
Normal Q-Q Plot of PBCU
Normal Q-Q Plot of PASS
Expected Normal
Observed Value

Appendix E2 Independence check of variables

TS PLOT for independent and dependent variables

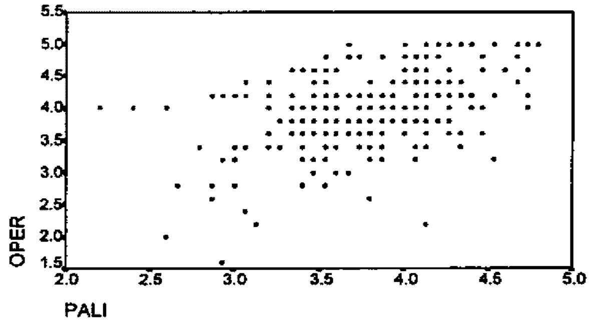




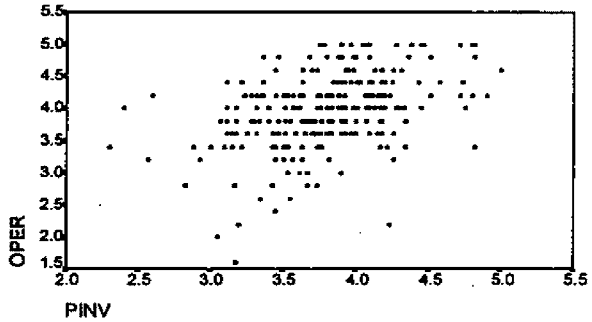
Note:
Missing values in TS plots because responding companies did not answer the questions.

Appendix E3 Linearity check of variables

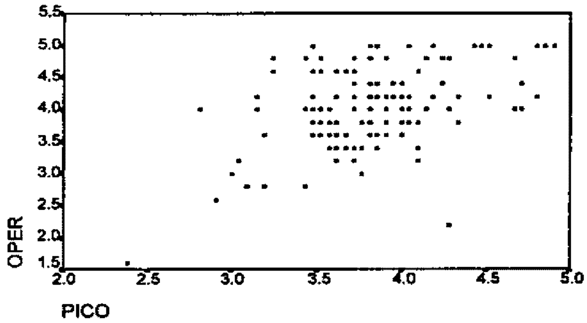
Linearity between independent and dependent variables



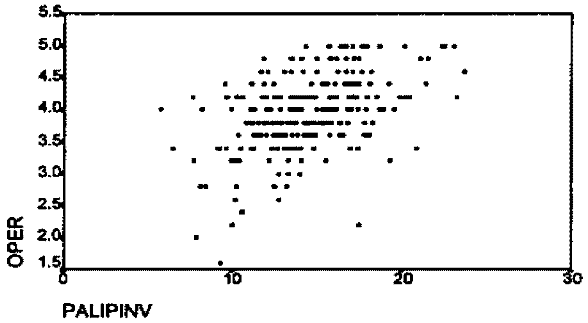
(Beta = 0.436, p = 0.000)



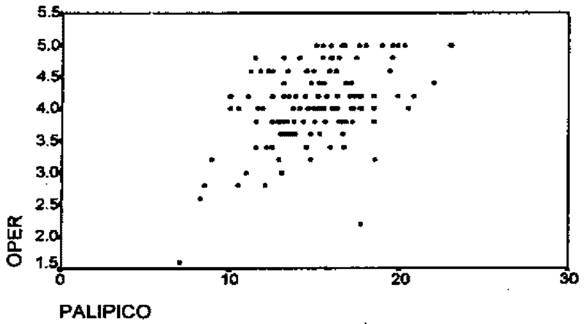
(Beta = 0.427, p = 0.000)



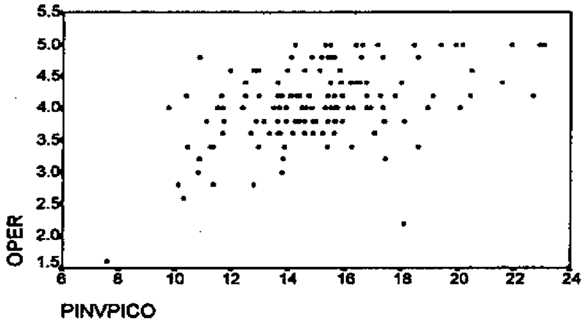
(Beta = 0.425, p = 0.000)



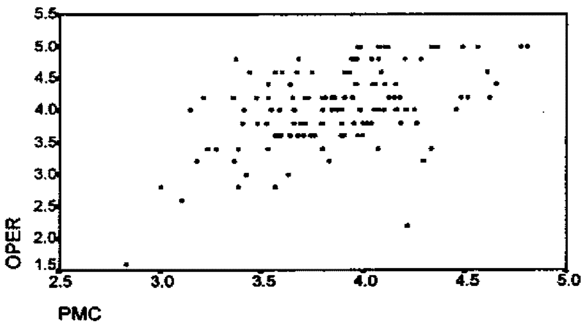
(Beta = 0.466, p = 0.000)



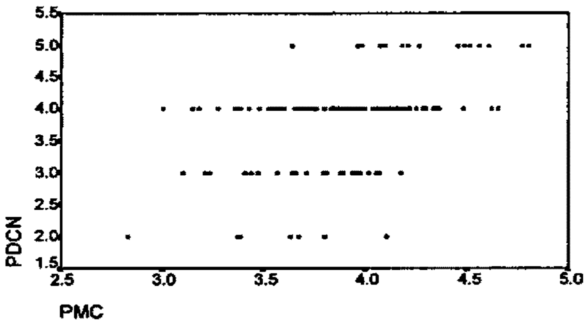
(Beta = 0.482, p = 0.000)



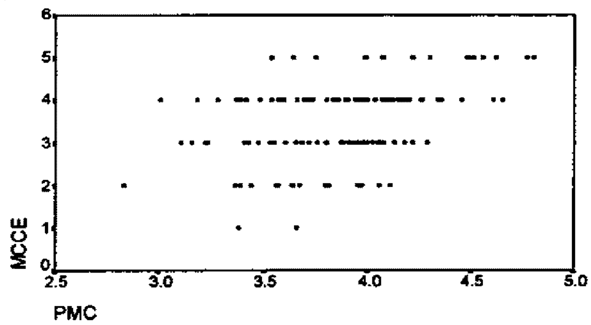
(Beta = 0.458, p = 0.000)



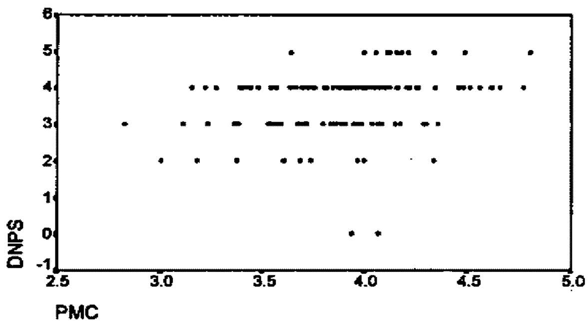
(Beta = 0.491, p = 0.000)



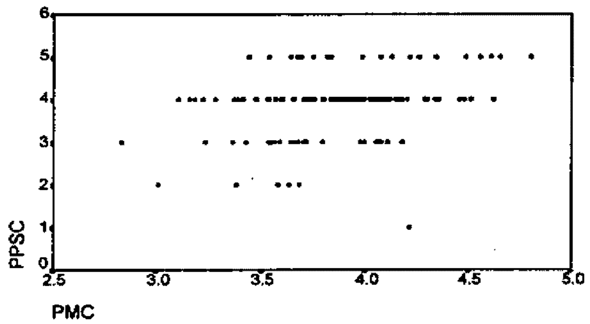
(Beta = 0.442, p = 0.000)



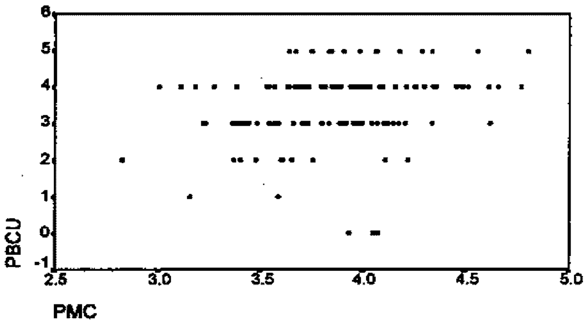
(Beta = 0.422, p = 0.000)



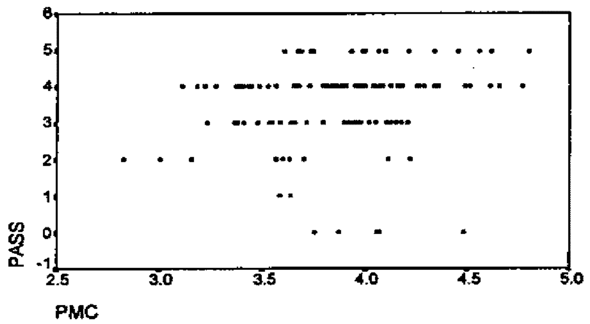
(Beta = 0.259, p = 0.002)



(Beta = 0.332, p = 0.000)

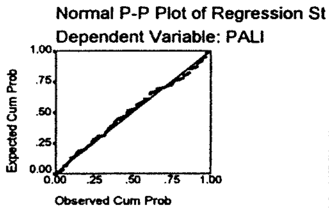
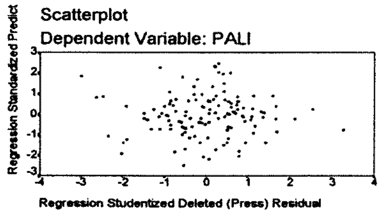
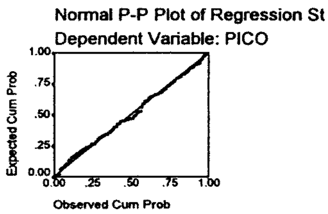
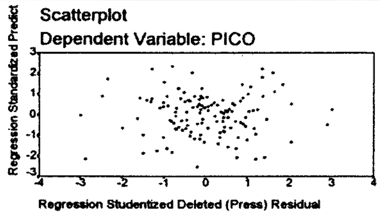
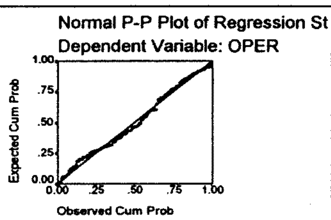
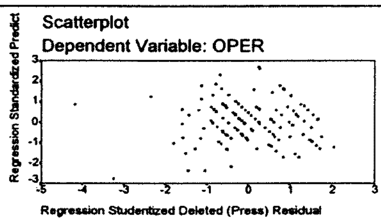


(Beta = 0.200, p = 0.020)



(Beta = 0.203, p = 0.019)

Appendix F Multiple regression diagnostic check

Independency of Residual	Normality of Residual	Homoscedasticity of Residual
Diagnostic check for Regression 1 Durbin Watson Statistic = 1.983 For n = 135, significant level = 0.05, Critical values for the D-W d statistics: $d_L = 1.63$ $d_U = 1.72$ Rejection region: $d < d_L$ $\Longrightarrow$ $d < 1.63$ Non-rejection region: $d > d_U$ $\Longrightarrow$ $d > 1.72$ Durbin Watson Statistics = 1.983 in non-rejection region $\Longrightarrow$ No residual correlation		
Diagnostic check for Regression 2 Durbin Watson Statistic = 2.080 For n = 135, significant level = 0.05, Critical values for the D-W d statistics: $d_L = 1.63$ $d_U = 1.72$ Rejection region: $d > 4 - d_L$ $\Longrightarrow$ $d > 2.37$ Non-rejection region: $d < 4 - d_U$ $\Longrightarrow$ $d < 2.28$ Durbin Watson Statistics = 2.080 in non-rejection region $\Longrightarrow$ No residual correlation		
Diagnostic check for Regression 4 Durbin Watson Statistic = 2.175 For n = 134, significant level = 0.05, Critical values for the D-W d statistics: $d_L = 1.63$ $d_U = 1.72$ Rejection region: $d > 4 - d_L$ $\Longrightarrow$ $d > 2.37$ Non-rejection region: $d < 4 - d_U$ $\Longrightarrow$ $d < 2.28$ Durbin Watson Statistics = 2.175 in non-rejection region $\Longrightarrow$ No residual correlation		
Diagnostic check for Regression 5 Durbin Watson Statistic = 2.174 For n = 134, significant level = 0.05, Critical values for the D-W d statistics: $d_L = 1.61$ $d_U = 1.74$ Rejection region: $d > 4 - d_L$ $\Longrightarrow$ $d > 2.39$ Non-rejection region: $d < 4 - d_U$ $\Longrightarrow$ $d < 2.26$ Durbin Watson Statistics = 2.174 in non-rejection region $\Longrightarrow$ No residual correlation