

**Selecting Quality Management and  
Improvement Initiatives:**

Case studies of industries in Thailand

**By**

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## **ABSTRACT**

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Many organisations invest a considerable amount of capital and resources, implementing new techniques to improve their operating performance. Many approaches and techniques are available. New fashionable methods tend to displace older approaches, which may still have value. An effective strategy for selecting and implementing improvement initiatives is an important issue to ensure stakeholder satisfaction. This research aims to investigate quality management and continuous improvement practices, study and analyse several approaches leading to continuous improvement (CI), then construct a framework to assist senior management teams, by providing a decision aid for selecting improvement initiatives. Six key improvement approaches including Total Quality Management (TQM), Six Sigma, ISO9001, Business Process Reengineer (BPR), Lean production (Lean), Business Excellence framework (BE) were selected as the focus in this study.

The research was carried out in three phases. Phase One established a conceptual background for the adoption of CI initiatives based on qualitative and quantitative studies of the literature. It described the two decision criteria of fashion setting and pay-offs. Phase Two provided empirical studies of the Quality Management (QM) approaches adopted in three case companies in Thailand. Different decision criteria for the selection of CI approaches were identified from these case studies, together with suggestions from fourteen quality experts and two additional case companies. In-depth analyses of each case study plus interviews with quality experts provided a context and guidance in development of the decision-aid framework for selecting CI approaches. Then in Phase Three the decision-aid framework was proposed, verified, and refined in testing with a multinational case company of four different plants in the Asia Pacific region and two groups of Small and Medium Size Enterprises (SMEs) using action research and assessment questionnaires.

The primary outcome of this research is a decision-aid for selecting CI approaches, which demonstrated high utility in practice. The main contributions of this research are a decision-aid for selecting CI initiatives, which was developed and tested, and a number of advancements to the theory of QM and CI, the theory of management fashion, and the application of operations strategy in the QM context.

## PUBLICATIONS

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### JOURNAL ARTICLES

- Thawesaengkulthai, N. & Tannock, J.D. (2008), “Fashion setting in Quality Management and Continuous Improvement”, *International Studies of Management & Organisation*, (Accepted for publication).
- Thawesaengkulthai, N. & Tannock, J.D. (2006), “Pay-off criteria for Quality and Improvement Initiatives”, *International Journal of Quality and Reliability Management*, (Under peer review).
- Thawesaengkulthai, N. & Tannock, J.D. (2006), “Decision aid for selecting management initiatives”, *International Journal of Production Research, special issue* (Under peer review).

### CONFERENCE PAPERS

- Thawesaengkulthai, N. & Tannock, J.D. (2006), “Pay-off Selection Criteria for Quality and Improvement Initiatives”, *European Operations Management Association (EUROMA 2006)*, Glasgow, Scotland, 18-21 June.
- Thawesaengkulthai, N. & Tannock, J.D. (2005), “Trends in Quality Management and Continuous Improvement”, *Workshop on Trends and Fashions in Management studies*, European Institute for Advance Studies in Management Studies (EIASM), Lisbon, Portugal, 20-22 October.
- Thawesaengkulthai, N. & Tannock, J.D. (2005), “Improvement and Operational Effectiveness: A review of contemporary trends”, *Proceedings of the 10th International Conference on ISO9000 and TQM*, Shanghai, China, 26-31 March, pp.B99

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## TABLE OF CONTENTS

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<b>ABSTRACT</b> .....	<b>II</b>
<b>PUBLICATIONS</b> .....	<b>III</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>IV</b>
<b>LIST OF FIGURES</b> .....	<b>XI</b>
<b>LIST OF TABLES</b> .....	<b>XIV</b>
<b>LIST OF APPENDICES</b> .....	<b>XVI</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>XVIII</b>
<b>CHAPTER 1. INTRODUCTION TO THE RESEARCH STUDY</b> .....	<b>1</b>
1.1 BACKGROUND .....	1
1.2 RESEARCH AIM AND OBJECTIVES .....	4
1.3 SCOPE OF THE RESEARCH .....	5
1.4 INDUSTRIAL COLLABORATORS FOR CASE STUDIES .....	5
1.5 RESEARCH DESIGN .....	6
1.6 STRUCTURE OF THE THESIS .....	8
<b>CHAPTER 2. LITERATURE REVIEW</b> .....	<b>9</b>
2.1 DEFINITIONS OF CONTINUOUS IMPROVEMENT (CI).....	10
2.2 THE DEVELOPMENT OF CI APPROACHES THROUGH ‘QUALITY WAVES’ .....	12
2.2.1 <i>The evolving QM and CI agendas</i> .....	13
2.2.2 <i>Contemporary Continuous Improvement Initiatives</i> .....	16
2.2.3 <i>Selecting and blending – the recipe for CI</i> .....	21
2.3 ADOPTION OF MANAGEMENT INITIATIVES .....	24
2.3.1 <i>Rational and irrational theories of adoption</i> .....	24
2.3.2 <i>Selection views of QM initiatives</i> .....	28
2.3.3 <i>The Quality Management approach to the selection of initiatives</i> .....	29
2.3.4 <i>Operations Strategy: A focus on objectives and contingency approach</i> ....	31
2.4 MULTI-CRITERIA DECISION-MAKING .....	34

2.4.1	<i>Multi-Criteria Decision-making and the Multi-Criteria Decision Aid</i> .....	35
2.4.2	<i>The process of multi-criteria decision-making</i> .....	36
2.4.3	<i>Weight Sum Methods for evaluating alternatives</i> .....	37
2.4.4	<i>Weighting of the criteria</i> .....	38
2.4.5	<i>Criteria rating</i> .....	39
2.4.6	<i>Calculation of total score and ranking</i> .....	40
2.4.7	<i>Results and analysis</i> .....	41
2.5	CONCLUSIONS.....	41
 <b>CHAPTER 3. RESEARCH STRATEGY AND METHODOLOGY</b> .....		<b>44</b>
3.1	THEORETICAL FOUNDATION AND RESEARCH PHILOSOPHY .....	45
3.2	RESEARCH DESIGN .....	47
3.3	PHASE 1: ESTABLISHING A CONCEPTUAL BACKGROUND .....	52
3.3.1	<i>Print Media Indicators (PMI) and company usage</i> .....	52
3.3.2	<i>Content analysis</i> .....	55
3.4	PHASE 2: INVESTIGATING CI PRACTICES AND DEVELOPING A SELECTION FRAMEWORK .....	56
3.4.1	<i>Case study</i> .....	56
3.4.2	<i>Data collection</i> .....	58
3.4.3	<i>Data analysis</i> .....	60
3.5	PHASE 3: OPERATIONALISING AND REFINING THE DECISION AID .....	63
3.6	SELECTION OF CASE COMPANIES .....	65
3.6.1	<i>CASE A: The Siam Cement Group</i> .....	66
3.6.2	<i>CASE B: PTT</i> .....	70
3.6.3	<i>CASE C: Johnson &amp; Johnson Thailand (JJTH)</i> .....	73
3.7	CONCLUSION.....	75
 <b>CHAPTER 4. ESTABLISHING A CONCEPTUAL BACKGROUND- FASHION SETTING AND PAY-OFF</b> .....		<b>77</b>
4.1	FASHION SETTING AS AN ADOPTION PHENOMENON .....	77
4.1.1	<i>Introduction</i> .....	78
4.1.2	<i>Exploring fashions using Print Media Indicators</i> .....	79

4.1.3	<i>Trends in techniques and approaches</i> .....	81
4.1.4	<i>Comparisons between publication rates and industrial practice</i> .....	84
4.1.5	<i>The international dimension – adoption or adaptation?</i> .....	87
4.1.6	<i>Dissemination of management fashions through internet search</i> .....	89
4.1.7	<i>Conclusion of ‘fashion setting’</i> .....	93
4.2	<b>PAY-OFF AS SELECTION CRITERIA</b> .....	95
4.2.1	<i>Introduction</i> .....	95
4.2.2	<i>Selecting and organising the pay-off evidence</i> .....	97
4.2.3	<i>The pay-off matrix</i> .....	100
4.2.4	<i>Data analysis and discussions</i> .....	101
4.2.5	<i>Conclusion of ‘pay-offs’</i> .....	107
4.3	<b>CONCLUSION</b> .....	108

## **CHAPTER 5. QUALITY MANAGEMENT APPROACHES IN THE CASE**

### **STUDY COMPANIES..... 109**

5.1	<b>CONCEPTUAL BACKGROUND</b> .....	109
5.2	<b>FRAMEWORK DEVELOPED THROUGH IN-DEPTH CASE STUDIES</b> .....	112
5.3	<b>CASE A: THE SIAM CEMENT GROUP (SCG)</b> .....	114
5.3.1	<i>The development of quality management at SCG</i> .....	114
5.3.2	<i>Quality Management position</i> .....	117
5.3.3	<i>Importance and triggers of QM and CI at SCG</i> .....	118
5.3.4	<i>The approaches adopted overall</i> .....	120
5.3.5	<i>Total Quality Management at SCG</i> .....	120
5.3.6	<i>The reasons for TQM, ISO9001, and Quality Awards</i> .....	121
5.3.7	<i>Effectiveness of CI approaches</i> .....	128
5.3.8	<i>Critical success factors and barriers to CI</i> .....	130
5.3.9	<i>Drilling down opinions of employees in a Group Company, The Siam Refractory Industry Co., Ltd. (SRIC)</i> .....	131
5.3.10	<i>The future for TQM at SCG</i> .....	135
5.4	<b>CASE B: PTT</b> .....	135
5.4.1	<i>The development of QSHE management at PTT</i> .....	136
5.4.2	<i>Quality Safety Health and Environment management at PTT</i> .....	137
5.4.3	<i>Importance and triggers of QM and CI at PTT</i> .....	138

5.4.4	<i>The approaches adopted overall</i> .....	139
5.4.5	<i>The reasons for 5S, QC, suggestion system, ISO9001, and other initiatives</i> .....	141
5.4.6	<i>Effectiveness of CI approaches</i> .....	145
5.4.7	<i>Critical success factors and barriers to CI</i> .....	146
5.4.8	<i>Drilling down- opinions of employees</i> .....	147
5.4.9	<i>The future for QSHE at PTT</i> .....	150
5.5	CASE C: JOHNSON & JOHNSON THAILAND .....	151
5.5.1	<i>The development of QM and Process Excellence at JJTH</i> .....	151
5.5.2	<i>Process Excellence at JJTH</i> .....	153
5.5.3	<i>Importance and triggers of CI at JJTH</i> .....	155
5.5.4	<i>The approaches adopted overall</i> .....	156
5.5.5	<i>The reasons for PE, CIP, Six Sigma, Lean, and GMP: cost savings rather than quality improvement</i> .....	157
5.5.6	<i>Effectiveness of CI approaches</i> .....	159
5.5.7	<i>Critical success factors and barrier to CI</i> .....	160
5.5.8	<i>Drilling down- opinions of employees</i> .....	162
5.5.9	<i>The future for Process Excellence at JJTH</i> .....	164
5.6	DISCUSSION AND CONCLUSION.....	164

**CHAPTER 6. DEVELOPING A FRAMEWORK OF SELECTION ..... 166**

6.1	INITIAL ELEMENTS OF THE FRAMEWORK .....	166
6.2	INTERVIEWS WITH EXPERTS.....	167
6.2.1	<i>Popular quality management and improvement initiatives in Thailand: TQM and ISO9001 or Six Sigma and Lean?</i> .....	168
6.2.2	<i>Triggers for the adoption</i> .....	170
6.2.3	<i>Expert criteria for selection: organisation fit and strategic fit</i> .....	172
6.2.4	<i>Current approaches for the selection of improvement initiatives</i> .....	175
6.3	FRAMEWORK DEVELOPED THROUGH CROSS-CASE ANALYSIS ..	176
6.3.1	<i>Rating the importance of pay-offs</i> .....	179
6.4	DEVELOPING THE THEORY OF SELECTION .....	181
6.4.1	<i>Paradigm I: Fashion setting</i> .....	182
6.4.2	<i>Paradigm II: Pay-Off</i> .....	183
6.4.3	<i>Paradigm III: Strategic fit</i> .....	184

6.4.4	<i>Paradigm IV: Organisation fit</i> .....	185
6.5	AREAS ASSOCIATED WITH THE SELECTION PROCESS .....	190
6.5.1	<i>Effective management of the adopted initiatives</i> .....	190
6.5.2	<i>Key factors to sustain management fashions</i> .....	192
6.5.3	<i>Management fashion's supply chain</i> .....	193
6.6	CONCLUSION.....	196
<b>CHAPTER 7. A PROPOSED DECISION AID FOR SELECTING</b>		
<b>IMPROVEMENT INITIATIVES .....</b>		<b>197</b>
7.1	EXPECTATIONS AND CHARACTERISTICS OF DECISION AIDS.....	197
7.2	SCOPE AND ASSUMPTIONS OF THE DECISION AID .....	200
7.3	THE SELECTION FRAMEWORK AND DECISION AID.....	200
7.4	PROCESS FOR EVALUATING AND SELECTING THE INITIATIVE ...	202
7.4.1	<i>Initial briefing</i> .....	202
7.4.2	<i>Step 1: Brainstorming and agreeing upon the sub-criteria</i> .....	203
7.4.3	<i>Step 2: Weighting the selection view and decision criteria</i> .....	204
7.4.4	<i>Step 3: Rating and ranking</i> .....	205
7.4.5	<i>Step 4: Result and analysis</i> .....	207
7.5	TESTING AND REFINING THE SELECTION PROCESS.....	208
7.5.1	<i>Workshop with a multinational company- Essilor</i> .....	208
7.5.2	<i>Workshop with Small and Medium size Enterprise (SMEs)</i> .....	215
7.5.3	<i>Feedback and suggestions for improvement</i> .....	220
7.6	THE REFINED FRAMEWORK AND PROCESS.....	223
7.7	CONCLUSIONS.....	224
<b>CHAPTER 8. DISCUSSION AND CONCLUSION .....</b>		<b>225</b>
8.1	SUMMARY OF THE RESEARCH FINDINGS .....	225
8.2	CONTRIBUTIONS TO KNOWLEDGE .....	231
8.3	LIMITATIONS.....	232
8.4	AREAS FOR FUTURE RESEARCH .....	233
<b>REFERENCES: .....</b>		<b>235</b>
<b>APPENDICES:.....</b>		<b>252</b>

## LIST OF FIGURES

---

FIGURE 1.1: THE RESEARCH DESIGN FRAMEWORK .....	7
FIGURE 2.1: FOUR MAJOR DISCIPLINES IN THE LITERATURE REVIEW .....	9
FIGURE 2.2: PROCESSES OF CONTINUOUS IMPROVEMENT, <i>ADAPTED FROM IMAI (1986)</i> .....	12
FIGURE 2.3: EVOLUTION OF ORGANISATIONAL PARADIGM AND ORIGINS OF QM AND CI APPROACHES .....	16
FIGURE 2.4: CURRENT CONTINUOUS IMPROVEMENT APPROACHES AND TECHNIQUES .....	20
FIGURE 2.5: BLENDING RECIPE FOR CI IN THE CURRENT LITERATURE.....	23
FIGURE 2.6: PRESCRIPTIVE APPROACH TO THE SELECTION OF QM TECHNIQUES .....	30
FIGURE 2.7: AN IMPLEMENTATION MODEL FOR ORGANISATIONAL EXCELLENCE (DTI 2004) ....	31
FIGURE 2.8: PROCESS OF MANUFACTURING STRATEGY AND STRATEGIC DECISION-MAKING ( <i>ADAPTED FROM PLATTS &amp; GREGORY 1990; KIM &amp; ARNOLD 1996; HARRISON 1999; AND TAN &amp; PLATTS 2004</i> ).....	36
FIGURE 2.9: A COMMON STRUCTURE OF A MCDA.....	38
FIGURE 3.1: AN OVERALL PICTURE OF A RESEARCH DESIGN (ADAPTED FROM SAUNDERS <i>ET AL.</i> 2007) .....	45
FIGURE 3.2: RESEARCH DESIGN.....	51
FIGURE 3.3: PROQUEST ELECTRONIC PUBLICATION DATABASES .....	54
FIGURE 3.4: THE THREE GROUPS OF INTERVIEWEES .....	59
FIGURE 3.5: THE PARADIGM MODEL IN AXIAL CODING .....	61
FIGURE 3.6: ANALYSIS SEQUENCES .....	62
FIGURE 3.7: LOGO OF SCG COMPANIES PARTICIPATED IN THIS RESEARCH.....	66
FIGURE 3.8: JOHNSON & JOHNSON THAILAND .....	74
FIGURE 4.1: FREQUENCY OF HITS AND TRENDS FOR IMPROVEMENT THEMES FROM PROQUEST (1990-2004).....	80
FIGURE 4.2: FREQUENCY OF HITS AND TRENDS FOR TECHNIQUE AND APPROACHES FROM PROQUEST (1990-2004) .....	82
FIGURE 4.3: PUBLICATIONS ON APPROACHES IN 2004.....	83
FIGURE 4.4: COMPARISONS BETWEEN ACADEMIC TRENDS AND COMPANY UTILISATION .....	86
FIGURE 4.5: PATTERNS OF LIFE CYCLE IN ACADEMIC PUBLICATION AND COMPANY'S USAGE RATE .....	88
FIGURE 4.6: DISSEMINATION AND ADAPTED VERSION OF QM INITIATIVES .....	89
FIGURE 4.7: TRENDS IN THE ONLINE SEARCH VOLUME OF FIVE QM TECHNIQUES .....	90
FIGURE 4.8: BAR CHART OF THE TOP TEN REGIONS SEARCHED FOR 'SIX SIGMA' AND 'TQM' ...	92
FIGURE 4.9: EXAMPLE OF THE DATABASE .....	98
FIGURE 4.10: PAY-OFF PROFILE FOR QUALITY AND IMPROVEMENT INITIATIVES .....	105

FIGURE 4.11: NUMBER OF SIMILAR CLAIMED BENEFITS .....	106
FIGURE 5.1: DEVELOPMENT PROCESS OF PRELIMINARY FRAMEWORK.....	109
FIGURE 5.2: INITIAL CONCEPTUAL BACKGROUND .....	111
FIGURE 5.3: PROCESS OF TQM ADOPTION AND SCG BUSINESS DEVELOPMENT .....	115
FIGURE 5.4: HOUSE OF TQM AT SRIC.....	121
FIGURE 5.5: SIGNIFICANCE OF TQM TO SCG PERFORMANCE .....	129
FIGURE 5.6: CI ACTIVITIES AND QUALITY TECHNIQUES AND TOOLS AT SRIC.....	132
FIGURE 5.7: TIME AND PLACE TO CONDUCT CI ACTIVITIES IN SRIC .....	132
FIGURE 5.8: DISTRIBUTION OF THE NUMBER OF HOURS SPENT ON CI ACTIVITIES PER WEEK, AND THE NUMBER OF SUGGESTIONS AND TRAINING HOURS PER YEAR IN SRIC.....	133
FIGURE 5.9: PROCESS OF CI ADOPTION AND PTT BUSINESS DEVELOPMENT.....	136
FIGURE 5.10: QSHE MANAGEMENT PHILOSOPHY.....	137
FIGURE 5.11: QSHE POLICY .....	138
FIGURE 5.12: COMPETITIVE ADVANTAGE AS TRIGGERS TO QM AND CI IN PTT .....	139
FIGURE 5.13: QSHE ACTIVITIES AND QUALITY TOOLS IN PTT.....	148
FIGURE 5.14: TIME AND PLACE TO CONDUCT QSHE ACTIVITIES .....	148
FIGURE 5.15: QUALITY AND CONTINUOUS IMPROVEMENT JOURNEY AND JJTH BUSINESS DEVELOPMENT .....	152
FIGURE 5.16: J&J'S QUALITY JOURNEY (JOHNSON & JOHNSON 2002B).....	153
FIGURE 5.17: J&J'S CONTINUOUS IMPROVEMENT STRATEGY THROUGH THE PE DEPLOYMENT.....	154
FIGURE 5.18: IMPROVEMENT ACTIVITIES AND QUALITY TECHNIQUES AT JJTH.....	162
FIGURE 5.19: TIME AND PLACE TO CONDUCT IMPROVEMENT ACTIVITIES IN JJTH.....	163
FIGURE 6.1: INITIAL ELEMENTS OF THE FRAMEWORK .....	167
FIGURE 6.2: TQM FRAMEWORK IN AIS AND TMT .....	170
FIGURE 6.3: THE EXPERTS' RULE OF THUMB FOR THE ADOPTION OF INITIATIVES.....	175
FIGURE 6.4: GAP ANALYSIS APPROACH .....	176
FIGURE 6.5: COMPARISON BETWEEN CHOSEN AND PREFERRED CRITERIA FOR SELECTING IMPROVEMENT INITIATIVES.....	178
FIGURE 6.6: THE IMPORTANCE OF 45 SUB-CATEGORIES .....	180
FIGURE 6.7: THE IMPORTANCE OF BENEFITS AND IMPLICATIONS .....	180
FIGURE 6.8: FOUR ADOPTION PARADIGM.....	188
FIGURE 6.9: CI SELECTION FRAMEWORK.....	189
FIGURE 6.10: COMPANIES' QM AND CI FRAMEWORKS .....	191
FIGURE 6.11: EXPERTS' QM MODELS .....	191
FIGURE 6.12: A MACRO VIEW OF MANAGEMENT FASHION SUPPLY CHAIN (ADAPTED FROM ABRAHAMSON 1996).....	194
FIGURE 6.13: THE PROCESS OF MANAGEMENT FASHION SUPPLY CHAIN .....	196

FIGURE 7.1: IMPROVEMENT INITIATIVE SELECTION FRAMEWORK .....	201
FIGURE 7.2: PROCESS FOR EVALUATING AND SELECTING THE INITIATIVE .....	202
FIGURE 7.3: A SELECTION MATRIX FORM .....	203
FIGURE 7.4: PRO FORMA FOR RATING .....	204
FIGURE 7.5: EXAMPLE OF THE CALCULATION FOR TOTAL SCORE OF A SELECTION VIEW .....	206
FIGURE 7.6: EXAMPLE OF THE CALCULATION FOR THE OVERALL SCORE OF AN INITIATIVE .....	207
FIGURE 7.7: THE PERFORMANCE PROFILE TABLE AND GRAPHS .....	208
FIGURE 7.8: FOUR GROUPS OF DECISION-MAKERS FROM ESSILOR .....	210
FIGURE 7.9: THE RELATIVE IMPORTANCE OF THE FOUR SELECTION VIEWS IN ESSILOR .....	211
FIGURE 7.10: SELECTION MATRIX FROM THE ESSILOR PHILIPPINES' PLANT .....	212
FIGURE 7.11: PERFORMANCE PROFILES FROM THE ESSILOR PHILIPPINES' PLANT .....	213
FIGURE 7.12: TWO GROUPS OF DECISION-MAKERS FROM SMES .....	216
FIGURE 7.13: THE RELATIVE IMPORTANCE OF THE FOUR SELECTION VIEWS IN SMES WORKSHOP .....	217
FIGURE 7.14: SELECTION MATRIX FROM THE UMBRELLA MANUFACTURING COMPANY X (SMES) .....	218
FIGURE 7.15: PERFORMANCE PROFILES FROM THE UMBRELLA MANUFACTURING COMPANY (SMES) .....	219
FIGURE 7.16: SUMMARY OF THE ASSESSMENT QUESTIONNAIRES FROM THE ESSILOR WORKSHOP .....	221
FIGURE 7.17: SUMMARY OF THE ASSESSMENT QUESTIONNAIRES FROM ESSILOR AND SMES WORKSHOPS .....	221

## LIST OF TABLES

---

TABLE 2.1: FIVE MAJOR PHASES OF QUALITY EVOLUTION (ADAPTED FROM GARVIN 1988) .....	14
TABLE 2.2: NATURE OF IMPROVEMENT SOUGHT (HAYES <i>ET AL.</i> 2005).....	20
TABLE 2.3: THEORETICAL PERSPECTIVES ON THE ADOPTION OF IDEAS AND PRACTICES (STURDY 2004) .....	25
TABLE 2.4: PROPOSITIONS OF THE ADOPTION SUGGESTED BY THEORIES .....	27
TABLE 2.5: WEIGHTING METHODS (CÁÑEZ 2000) .....	39
TABLE 3.1: POSITIONS OF KNOWLEDGE CLAIMS AND PHILOSOPHICAL ASSUMPTION .....	46
TABLE 3.2: ALTERNATIVE STRATEGIES OF RESEARCH INQUIRY .....	48
TABLE 3.3: RESEARCH OBJECTIVES AND THE RESEARCH PROCESS .....	50
TABLE 3.4: RELEVANT SITUATIONS FOR DIFFERENT RESEARCH STRATEGIES (YIN 1994).....	56
TABLE 3.5: TOTAL NUMBER OF INTERVIEWEES .....	60
TABLE 3.6: ASSESSMENT CRITERIA .....	64
TABLE 3.7: PTT’S REWARDS AND RECOGNITION.....	73
TABLE 4.1: COMPARISONS BETWEEN THE POPULARITY OF QM AND CI INITIATIVES BETWEEN ACADEMIC PUBLICATIONS AND COMPANY UTILISATION .....	85
TABLE 4.2: CATEGORIES OF EVIDENCE.....	98
TABLE 4.3: ASSESSMENT CRITERIA AND ASSESSMENT SCORE.....	100
TABLE 4.4: MATRIX DIAGRAM FOR ASSESSING PAY-OFF CLAIMS.....	101
TABLE 4.5: SIMILARITIES AND DIFFERENCES AMONG THE INITIATIVES .....	103
TABLE 4.6: NUMBERS OF SIMILAR PAY-OFFS REGARDING THE SIX INITIATIVES .....	106
TABLE 5.1: SELECTION CRITERIA FROM LITERATURE.....	112
TABLE 5.2: SUMMARY OF CASE COMPANIES’ BACKGROUND .....	113
TABLE 5.3: QUALITY MANAGEMENT DEVELOPMENT AT SCG .....	115
TABLE 5.4: THAI CHARACTERISTICS AND THE REASONS FOR TQM .....	123
TABLE 5.5: REASONS FOR IMPLEMENTING ISO9001 FROM LITERATURE .....	125
TABLE 5.6: SUMMARY OF REASONS TO THE ADOPTION OF CI INITIATIVES IN SCG .....	128
TABLE 5.7: COST AND TIME TO IMPLEMENT TQM, ISO9001, AND QUALITY AWARDS .....	129
TABLE 5.8: CATEGORY OF MOTIVATION TO CI ACTIVITIES IN SRIC .....	134
TABLE 5.9: THAI CHARACTERISTICS AND REASONS FOR IMPROVEMENT ACTIVITIES.....	142
TABLE 5.10: SUMMARY OF REASONS FOR THE ADOPTION OF CI INITIATIVES IN PTT .....	145
TABLE 5.11: TIME TO IMPLEMENT CI ACTIVITIES IN PTT.....	146
TABLE 5.12: CATEGORY OF MOTIVATION TO PARTICIPATE IN QSHE ACTIVITIES IN PTT.....	149
TABLE 5.13: SUMMARY OF REASONS FOR THE ADOPTION OF CI INITIATIVES IN JJTH.....	159
TABLE 5.14: CATEGORY OF MOTIVATION TO PARTICIPATE IN IMPROVEMENT ACTIVITIES IN JJTH	164

TABLE 6.1: SUMMARY OF CHOSEN AND PREFERRED DECISION CRITERIA .....	177
TABLE 6.2: HIGHLY MENTIONED SUB-CRITERIA .....	179
TABLE 6.3: CASES AND THE SELECTION CRITERIA.....	182
TABLE 6.4: A THEORY OF SELECTION .....	186
TABLE 7.1: EXPECTATION AND CHARACTERISTICS OF A DECISION AID.....	198
TABLE 8.1: A SUMMARY OF RESEARCH OBJECTIVES AND KEY FINDINGS.....	227

## LIST OF APPENDICES

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APPENDIX 1: THEORETICAL GAP IN QM AND CI LITERATURES .....	252
APPENDIX 2: WORLDWIDE NUMBERS OF ISO9000 CERTIFICATES (BASED ON ISO SURVEY 2005).....	253
APPENDIX 3: COMPARISONS IN CORE ELEMENTS OF INCREMENTAL IMPROVEMENT (TQM, ISO9001, LEAN PRODUCTION).....	254
APPENDIX 4: COMPARISONS IN CORE ELEMENTS OF DRAMATIC IMPROVEMENT (SIX SIGMA, BPR).....	256
APPENDIX 5: COMPARISONS IN CORE ELEMENTS OF INTERNAL AND EXTERNAL ASSESSMENTS (BALANCED SCORECARD, SELF-ASSESSMENT BY MBNQA, EFQM AND BENCHMARKING).....	258
APPENDIX 6: THE SCIENTIFIC THEORY-BUILDING PROCESS ( <i>WALLACE 1971, P.18</i> ).....	260
APPENDIX 7: THE RESEARCH STRUCTURE IN OM FIELD ( <i>PLATTS ET AL. 2001</i> ).....	260
APPENDIX 8: SEMI-STRUCTURED INTERVIEW (GROUP 1: ACADEMICS/ CONSULTANTS).....	261
APPENDIX 9: SEMI-STRUCTURED INTERVIEW (GROUP 2: INDUSTRIALISTS IN TOP MANAGEMENT/SENIOR MANAGERS).....	266
APPENDIX 10: SEMI-STRUCTURED INTERVIEW (GROUP 3: INDUSTRIALISTS IN QI TEAM/TECHNICIANS).....	272
APPENDIX 11: LIST OF INTERVIEWEES.....	275
APPENDIX 12: THE ASSESSMENT QUESTIONNAIRE FOR THE TESTING WORKSHOP.....	278
APPENDIX 13: SCG BUSINESS EVOLUTION (1913-2005).....	282
APPENDIX 14: PTT FULLY VALUE CHAIN (PTT 2006).....	283
APPENDIX 15: DATA FOR TRENDS ANALYSIS.....	284
APPENDIX 16: THE DATABASE OF PAY-OFF EVIDENCE.....	285
APPENDIX 17: CREDIBILITY SCORES OF PAY-OFF CLAIMS FOR SIX INITIATIVES.....	292
APPENDIX 18: ORGANISATION CHART OF THE SIAM CEMENT GROUP.....	293
APPENDIX 19: REASONS FOR UNDERTAKING IMPROVEMENT PROGRAMMES AT SCG.....	293
APPENDIX 20: CI ACTIVITIES IN SRIC.....	294
APPENDIX 21: ATTITUDE OF EMPLOYEE ON QUALITY IMPROVEMENT PROGRAMME IN SRIC.....	295
APPENDIX 22: QSHE ORGANISATION STRUCTURE AT PTT.....	296
APPENDIX 23: REASONS FOR UNDERTAKING IMPROVEMENT PROGRAMMES AT PTT.....	296
APPENDIX 24: QSHE ACTIVITIES IN PTT.....	297
APPENDIX 25: ATTITUDE OF EMPLOYEES ON QSHE PROGRAMMES IN PTT.....	298
APPENDIX 26: JOHNSON AND JOHNSON CREDO.....	299
APPENDIX 27: REASONS FOR UNDERTAKING IMPROVEMENT PROGRAMMES AT JJTH.....	299
APPENDIX 28: TOTAL NUMBER OF CUSTOMERS' COMPLAINT IN JJTH.....	300
APPENDIX 29: IMPROVEMENT ACTIVITIES IN JJTH.....	301

APPENDIX 30: ATTITUDE OF EMPLOYEES ON IMPROVEMENT PROGRAMMES IN JJTH.....	302
APPENDIX 31: RATING SCORES IN THE IMPORTANCE OF PAY-OFF AND IMPLICATIONS .....	303
APPENDIX 32: SELECTION MATRIX AND PERFORMANCE PROFILES FROM ESSILOR CHINA PLANT	304
APPENDIX 33: SELECTION MATRIX AND PERFORMANCE PROFILES FROM ESSILOR THAILAND PLANT .....	305
APPENDIX 34: SELECTION MATRIX AND PERFORMANCE PROFILES FROM ESSILOR INDIA PLANT	306
APPENDIX 35: SELECTION MATRIX AND PERFORMANCE PROFILES FROM SMES SELLING COMPANY A.....	307

## LIST OF ABBREVIATIONS

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5S	Seiri (sifting), Seiton (sorting), Seiso (sweeping), Seiketsu (standardise), Shitsuke (sustain)
AHP	Analytic Hierarchy Process
AIS	Advanced Info Service plc.
AQL	Acceptable Quality Level
ASQ	The American Society for Quality
BPR	Business Process Reengineering
BQF	British Quality Foundation
BSC	Balanced Scorecard
CI	Continuous Improvement
COQ	Cost of Quality
CTQ	Critical-To-Quality
CWQC	Company Wide Quality Control
DFSS	Design For Six Sigma
DMADV	Define, Measure, Analyse, Design, Verify
DMAIC	Define, Measure, Analyse, Improve, Control
DOE	Design of Experiments
DTI	Department of Trade and Industry
EFQM	European Foundation for Quality Management
EQA	The European Quality Award
EVP	Executive Vice President
FMEA	Failure Mode and Effects Analysis
ISO	International Organisation for Standardisation
JIT	Just In Time
JJTH	Johnson & Johnson Thailand
JUSE	Japanese Union of Scientists and Engineers
KM	Knowledge Management
KPIs	Key Performance Indicators
LO	Learning Organisation
MADM	Multi-Attribute Decision-making
MBNQA	Malcolm Baldrige National Quality Award
MCDA	Multi-Criteria Decision Aid
MCDM	Multi-Criteria Decision-Making
MODM	Multi-Objective Decision-Making
NSTDA	National Science and Technology Development Agency (Thailand)

OB	Organisational Behaviour
OE	Operational Effectiveness
OM	Operations Management
ONAC	Office of the National Accreditation Council (Thailand)
OS	Operations Strategy
PDCA/ PDSA	Plan, Do, Check, Act/ Plan, Do, Study, Act
PE	Process Excellence
PMI	Print Media Indicators
PTT	PTT public company limited
QA	Quality Assurance
QC	Quality Control
QCC	Quality Control Circle
QFD	Quality Function Deployment
QM	Quality Management
QMS	Quality Management System
QSHE	Quality, Safety, Health, and Environment
SAW	Simple Additive Weighting
SCG	The Siam Cement Group
SMED	Single-minute exchange of dies
SMEs	Small and Medium Size Enterprises
SPC	Statistical Quality Control
TMT	Toyota Motor Thailand
TPI	Thailand Productivity Institute
TPM	Total Productive Maintenance
TQA	Thailand Quality Award
TQC	Total Quality Control
TQM	Total Quality Management
TQPC	Total Quality Promotion Centre
VP	Vice President
WSM	Weighted Sum Model

## **CHAPTER 1. INTRODUCTION TO THE RESEARCH STUDY**

‘Choose the best tools for the job: Managers need a rational system for selecting, implementing and integrating the tools appropriate for their companies. A tool will improve results only to the extent that it helps discover unmet customer needs, helps build distinctive capabilities and helps exploit the vulnerabilities of competitors- or a combination of all three.’

(Rigby & Bilodeau 2005a, p.8)

This chapter outlines the research background, states the research aim and objectives, and describes the research scope. The case studies and industrial collaboration, together with the research design are briefly explained. Finally, it concludes with a description of the structure of this thesis.

### **1.1 BACKGROUND**

Key competitive business strategies include both achieving lower cost and adding value through differentiation (Porter 1980). One important way in which competitive performance may be achieved is through quality improvement. This strategy can be used both to differentiate products and services and to obtain lower costs through enhanced productivity and the elimination of waste. An important question for managers is ‘what is the most appropriate way to improve?’ Both incremental improvement and innovation are valuable operational strategies to gain and maintain competitive advantage in the global market (Hammer 2005; Prajogo & Sohal 2001; Hamel 2001; Swinehart *et al.* 2000). Much of today’s emphasis is on breakthrough improvement, through developing and using new technology (Sower & Fair 2005), but incremental innovation, providing improvement from existing technology, is still the main improvement activity for many companies (Boer *et al.* 2000). However, to retain a leading position in the current competitive global environment, any company which aspires to achieve world-class performance must continuously improve key performance objectives such as cost, quality, productivity, flexibility and innovation (Slack & Lewis 2002). Both incremental improvement and radical innovation must be undertaken simultaneously in this fast-moving era (Conti *et al.* 2003; Hamel 2001; Brown *et al.* 2000; Swinehart *et al.* 2000) and are the key elements within a continual improvement (BSI 2004).

The increasing pressure towards continuous improvement (CI) and the organisational desire to achieve business excellence, high performance, or to become a world-class organisation drives the adoption improvement initiatives. The CI mindset has urged managers to continuously improve their operations and look for best practices to adopt; this has become a common practice especially in such fast-growing newly industrialised countries such as Thailand. The question of ‘what to adopt?’ creates an activity of searching for best practices. Feigenbaum has emphasised that in the twenty-first century, quality methods and tools are crucial to guide and assure continuous change and constant improvement in order to meet the constantly upward expectations of today’s global customers (Conti *et al.* 2003). At one time, there were only few choices to choose from, e.g. QCC, JIT, and 5S. Now, a plethora of improvement initiatives have been created, mainly from the United States, and Japan, and they have accumulated over the past fifty years of QM and CI development.

A number of recent articles have pointed out the importance of research in managing business ideas (Davenport & Prusak 2003; Marash *et al.* 2004; Voss 2005). This subject is important for three reasons: (1) the number of new management ideas and the providers of those ideas have significantly increased, (2) the pace of development of QM has advanced rapidly since the 1980s, and (3) innovative business ideas have become more important to companies’ products and services and more closely linked to business performance (Davenport & Prusak 2003). The growth in this paradigm, the adoption of best practices, has focused on two discussions: (1) institutional theory, and (2) management fads and fashion (Voss 2005). This ‘irrational’ motivation for the adoption of management initiatives has been extensively discussed in the area of organisational behaviour (Greatbatch & Clark 2005; Clark 2004; William 2004; Jackson 2001; Abrahamson 1996, 1991).

Managers who do not claim to adhere to the latest Quality Management (QM) or Continuous Improvement (CI) fashion may be afraid that they are slipping behind the competition – the ‘me-too’ syndrome. However, adopting a newly fashionable technique before understanding the true needs of the organisation is not the best option. A growing number of publications have questioned and raised awareness of improvement fashions, especially in the area of QM and CI (Slack *et al.* 2006; Dvorak 2006; Gibson *et al.* 2003; Van der Wiele *et al.* 2000). Light (2003) has warned that

managers who try to implement the process without understanding employees' attitudes would risk real damage. International differences exist: surveys from the project GLOBE (Global Leadership and Organisational Behaviour Effectiveness) indicated that Thai employees are among the most likely to obey their leaders when implementing new process improvement program, whereas the Danes and the Dutch, for example, tend to question their leaders (Light 2003). A number of publications in general management and strategic decision-making have urged managers to make rational decisions in initiative adoption (Miller & Hartwick 2002; Gibson & Tesone 2001; Cagliano & Spina 2000).

Most literature on QM and CI has focused on describing the concept, methodology, and tools of each approach, perhaps providing some empirical evidence on strengths, weaknesses and the critical success factors (see Appendix 1 for evidence of the theoretical gap in QM and CI literature). Although some surveys have identified trends and widely adopted QM and CI approaches (Charlesworth 2000; Bain & Company 2005a), there is a limited body of research and literature addressing rational decision criteria for selecting improvement initiatives. The managers' questions of 'which improvement approach should be embraced?', 'when to start these CI programmes?', and 'what should be the selection criteria?' remain unanswered, by the existing literature. Companies which have already implemented QM and CI initiatives still want to know which approaches would be best for their CI efforts and their stakeholders' value. This is a real concern which has not been adequately addressed in the literature on quality management and operations strategy (Voss 2005; Slack *et al.* 2006).

A number of universal QM models have been proposed (Bendell 2005; Ho 1999a; Krasachol 2000), but they do not take into account an organisation's contingencies, which are important (Sousa & Voss 2001). The typical criteria proposed in operations strategy literature - the company's competitive priorities (Hayes & Wheelwright 1984) or order winning criteria (Hill 1995, 2000) or manufacturing objectives of cost, quality, flexibility, and speed are too broad and may not cover all concerns for this specific selection. In terms of competitive operating advantages (Hayes *et al.* 2005; Slack & Lewis 2002), QM policy is considered to be one of the major decision categories in operations strategy (Hayes *et al.* 2005; Schroeder 1993; Hayes & Wheelwright 1984). Strategy concerning selection of types of improvements (e.g. BPR, TQM) is sometimes

developed at high level during the formulation process of corporate strategy and business strategy. However, these improvement initiatives are centred around and within operational functions (Slack & Lewis 2002), directly concern operations performance and act as drivers of operational effectiveness. Therefore, this type of decision should, arguably be situated in the decision area of Operations Strategy.

The focus of operations strategy has emphasised continuous process improvement and cost reduction (Slack & Lewis 2002). However, the existing literature on process in operations strategy has focused on the broad picture of how to formulate a manufacturing strategy and described the nature of improvement activities (Hayes *et al.* 2005; Hill 1995; Platts & Gregory 1990; Hayes & Wheelwright 1984), but provides little specific help in how to select and evaluate the choice of CI approach. In the absence of explicit key decision criteria, managers may base their selection decision on subjective judgements. This research aims to fill this gap by focusing on the operations strategy level, and developing a strategic decision aid for selecting a QM and improvement initiative; bringing all influential criteria together in one model. Addressing such complex problems involves several alternatives and numerous factors, and hence suggests the need for a strategic decision-aid model. Descriptions of the research questions and objectives of this research below will address these key issues, relating to the decision criteria, the process used when selecting these CI approaches and the impact of implementation in case-study companies.

## 1.2 RESEARCH AIM AND OBJECTIVES

‘A new orientation to the study of decision-making called the prescriptive orientation is to establish a systematic and wise approach in making decisions. The study of decision-making should combine normative theories with a deep understanding of the cognitive and behavioural aspects involved in real life decision-making.’

(Raiffa 1994 in Triantaphyllou 2000, p.261)

This research aims to **develop a strategic decision-aid for selecting Quality Management and improvement initiatives**. The outcome of this research will provide a framework and process, which will assist managers in choosing a suitable CI programme for the company. In order to fulfil the research aim, the following research objectives are proposed:

- (1) To investigate the approaches, activities, and trends towards continuous improvement.
- (2) To determine, evaluate, and compare the differentiations and benefits of the six initiatives.
- (3) To provide an empirical study of QM and CI activities and their effects in organisations.
- (4) To identify major criteria to be considered in selecting improvement initiatives and develop a framework for selection.
- (5) To develop, refine, and test a strategic decision-aid model for selecting an improvement initiative.

### **1.3 SCOPE OF THE RESEARCH**

The scope and focus of this research are described as below:

- The research is mainly focused on quality management and improvement programmes, which are TQM, Six Sigma, ISO 9001, Lean, Business Process Reengineering, Business Excellence (EFQM, MBNQA).
- The developed decision-aid is targeted towards an operations strategy level.
- The method of evaluation and prioritisation of the suggested improvement initiatives uses Multiple Criteria Decision-Making principles.

During the research other areas were developed and followed particularly the investigation of management fashions and adoption. It was derived from the first research objective, but became an important focus of the work and provided a part of the contribution to knowledge.

### **1.4 INDUSTRIAL COLLABORATORS FOR CASE STUDIES**

Several leading companies in Thailand which have experiences in quality improvement programmes were chosen to be case study companies. The Thai national context for this research is valuable because it is a rapidly-developing newly-industrialised country. Moreover, Thailand hosts a number of international manufacturing companies. Thai business people consider themselves to be proactive and open to the adoption of new

knowledge, technology and improvement approaches. Hence, the ‘what to adopt’ question is frequently addressed in Thai organisations.

The case study companies are:

- Primary case companies:
  - Case A: The Siam Cement Group (SCG)
  - Case B: PTT public company limited
  - Case C: Johnson & Johnson consumer products Thailand (JJTH)
- Secondary cases:
  - Toyota Motor Thailand (TMT)
  - Advanced Info Service PLC. (AIS)

The tested cases are:

- Case D: Essilor manufacturing companies in Asia-Pacific
- Case E: Thai SMEs groups

## **1.5 RESEARCH DESIGN**

The research design was divided into three main phases: the development of a conceptual background and a selection framework, and the validation and verification of a decision aid and a framework for selecting improvement initiatives. In the first phase, both qualitative and quantitative studies of the literature explained the adoption phenomenon and management fashion of QM and CI approaches. ‘Print Media Indicators’ method was employed to explore the interests and illustrate the trends of each improvement approach in the publication. A global company’s usage survey (Rigby & Bilodeau 2005a) supplements the evidence of trends in CI approaches. Additionally, content analysis was conducted to capture and categorise the claimed benefits of the six approaches. In the second phase, a preliminary selection framework was built and QM and CI practices in Thailand were explained, based on detailed investigations within three case-study companies and interviews with experts and two additional case companies. Finally, the decision aid for selecting QM and improvement initiatives was proposed and applied in two workshops using action research and assessment questionnaires. The detail research methodology is described in Chapter Three. The following diagram (see Figure 1.1) depicts the research design framework.

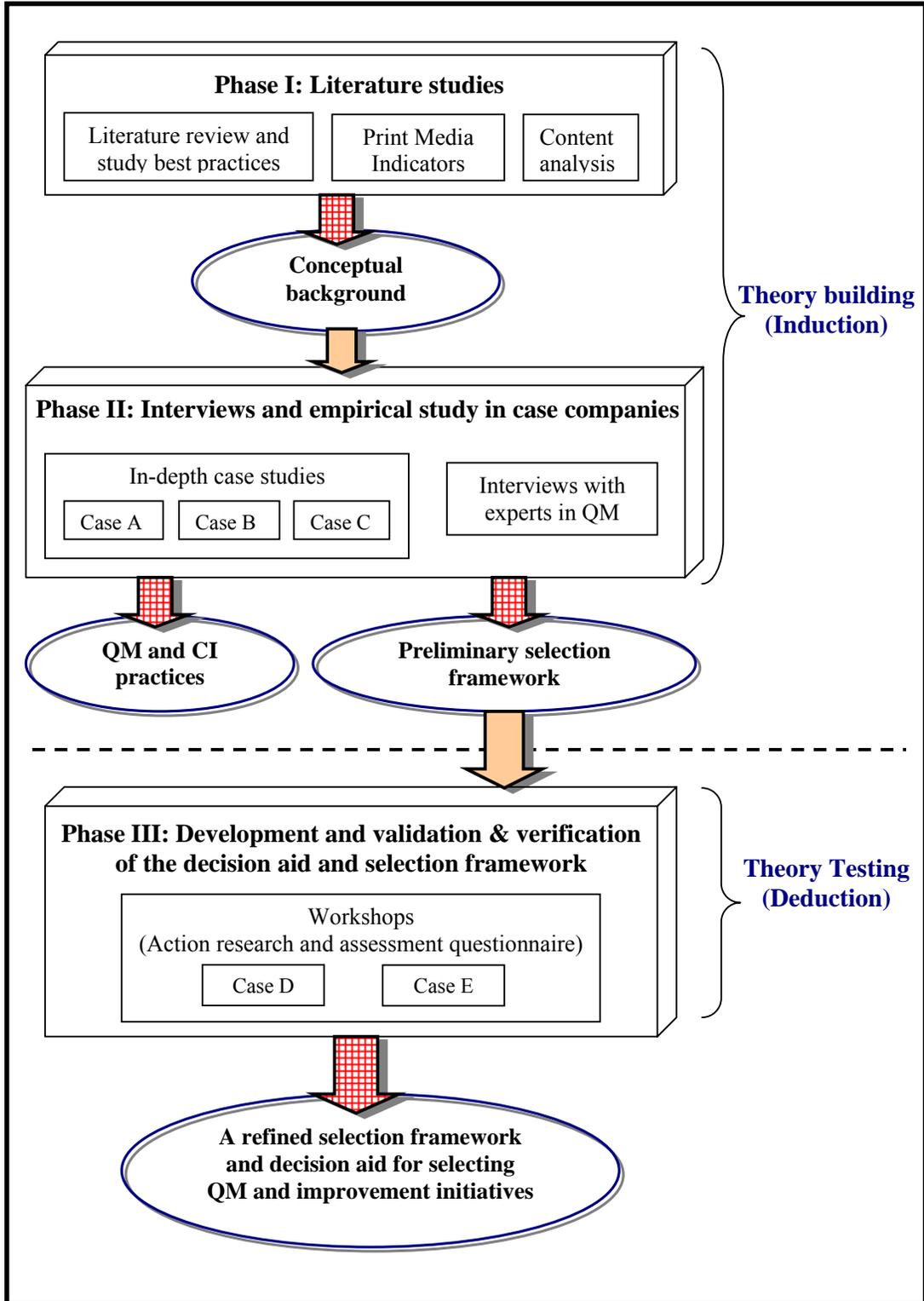


Figure 1.1: The research design framework

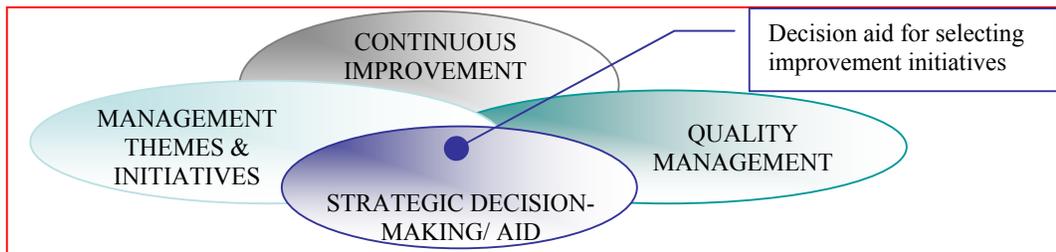
## 1.6 STRUCTURE OF THE THESIS

This thesis is divided into eight chapters, described as follows:

- This chapter introduces the reader to the research background and defines the research aims and objectives.
- Chapter Two reviews the literature on QM and CI (e.g. the approaches to CI together with their development and background). It also provides a theoretical background to the research including a review of theories of ideas adoption, operations strategy, and multi-criteria decision-making.
- Chapter Three describes the research design, explains and justifies the chosen research approach including the method of data collection and analysis. Moreover, it explains the selected case companies and their background.
- Chapter Four reports on the results of a further detailed quantitative literature analysis which established a conceptual background of fashion setting and pay-offs. Trends in CI approaches are identified and key pay-offs from the six approaches are summarised.
- Chapter Five summarises the conceptual background based on the literature review and analysis in Chapter Four. It further provides an in-depth empirical study of quality management practices in the three main case companies, and explores the reasons and motivations for the adoption which leads to the development of the decision-aid framework.
- Chapter Six refines the conceptual background and explains the development of the selection theory based on triangulation from the case studies and a number of interviews with experts in quality management.
- Chapter Seven proposes the decision aid framework for selecting a CI approach that incorporates both the selection process and the tool. Furthermore, it presents the results of two workshops with a multinational company and also a SMEs group which explains how the decision aid is further revised and refined. It also describes the evaluation of the feasibility, usability, and utility of the decision aid based, on the feedback and comments from the workshops.
- Chapter Eight concludes the thesis, by discussing the outcome of the research and the contribution to knowledge. The limitations of the research are indicated and some suggestions for future research are provided.

## CHAPTER 2. LITERATURE REVIEW

Chapter One briefly explained the research background and described the research objectives. This chapter reviews the relevant literature which underpins this research and describes how this research relates to existing works on quality management, continuous improvement, management initiatives, and strategic decision-aids. In the literature review, the combination of these four major disciplines provides the theoretical background to the decision-aid development as shown in Figure 2.1, which illustrates the author's positioning of this study.



**Figure 2.1: Four major disciplines in the literature review**

The pressures and needs to improve have triggered demands to adopt best practices or new management ideas. The evolution of QM has involved the development of a number of CI approaches (e.g. TQM, Six Sigma, Lean etc.). These CI approaches and the growing number of other management ideas and initiatives have raised the issue of management trends and fashions, which has inspired further research, including theories of adoption and the management of new ideas. The literature on operations strategy and multi-criteria decision aids have also been brought in to provide the background to structured decision-making processes and methods to evaluate multiple criteria.

This chapter begins by (2.1) summarising key theories and definition of Continuous Improvement, and (2.2) presents a brief overview of the origin and evolution of key QM and CI themes and approaches, elucidating contemporary improvement programmes in the dimensions of philosophy, aims, core concepts, major advantages or strengths, pitfalls or weaknesses, roadmap, tools and critical success factors. It then continues (2.3) by exploring the reasons for the adoption of CI approaches, next (2.4) examining multi-criteria decision-aid models to assist with the selection of CI approaches and finally (2.5) presenting the conclusion of this chapter.

## 2.1 Definitions of Continuous Improvement (CI)

Theorists have defined CI in various ways. Some distinguish CI from innovation; others consider that elements of business and technology innovation are embedded in CI. In Japan, 'Kaizen' or Continuous Improvement was introduced to many countries outside of Japan, by the book *Kaizen* (Imai 1986). Kaizen became known as a distinctive and successful feature of the Japanese management style. The improvements under Kaizen are typically small and incremental changes that involve everyone, entail relatively little expense, and focus on constant improvement efforts. In the context of Kaizen, management has two major functions: maintenance and improvement. Improvement according to Imai (1997, pp.3-4) is classified as either Kaizen or innovation. Imai (1986) also suggest that Kaizen strategy begins and ends with people (people-oriented), results can only be improved when first improving the process (process-oriented) and no improvement occurs without standards (standards-oriented).

This concept is still current with some authors. In the same tradition, Boer *et al.* (2000, p.2) defines CI as 'the planned organised and systematic process of ongoing, incremental and company-wide change of existing practices aimed at improving company performance'. Moreover, Sutherland & Canwell (2004, pp.55-57) describe the fundamental concepts of CI as

'...bringing an organisation to achieve long-term and sustainable improvement through a CI process which allows the organisation to improve over shorter periods of time and achieve change in the longer term by carefully and consistently measured steps, which address specific problems such as PDSA cycle, DMAIC.'

On the other hand, there are those who consider innovation as a part of CI. They describe CI in the terms of how changes are perceived within the organisation- radical vs. incremental improvement. This has been an increasingly popular, and the definitions of CI have tended to enlarge to include various concepts of innovation or radical change processes. Hence, Bessant & Caffyn (1997) describes CI as the process which builds upon the high involvement in innovation as thus:

'...CI is perceived as an organisation-wide process of focused and sustained incremental innovation, recognising that most innovative activity is not of the 'breakthrough' variety, but incremental in nature, depending for its effect on sustained and focused implementation. To develop CI, innovation routines are compulsory and during the CI journey an organisation can acquire and embed new behavioural patterns.'

Hamel (2001) similarly believes that incremental improvement (evolution) and radical innovation (revolution) are not mutually exclusive and both are vital in an organisation. He considered that “Many ‘small’ innovations can be accumulated as competitive positions in radical improvements. An important issue for today’s company is to decide how much they should engage in radical innovation.”

Kofoed *et al.* (2002) also discuss CI in terms of radical and incremental changes. In their opinion, incremental changes are implemented slowly and gradually over time and require little investment to implement. They are based on inductive logic and often involve employee participation in planning, directing and implementing improvement activities. By contrast, radical changes require considerable investments; they are targeted towards reorientation of the organisation in short, sudden and planned burst of activity and directed top-down on the basis of deductive logic.

The American Society for Quality (ASQ 2007) defines CI as an ‘ongoing effort to improve products, services, or processes. These efforts can seek incremental improvement over time or breakthrough improvement all at once.’ According to the European Standard EN ISO 9004: 2000 Guidelines for Performance Improvement (in BSI 2004, p.53), an organisation should have a continual process of improvement and there are two fundamental ways to achieve this: breakthrough projects and small-step ongoing improvement activities.

Bhuiyan & Baghel (2005) define CI as a culture of sustained improvement aiming to eliminate waste in all systems and processes in an organisation. CI occurs through a series of improvements: some cases are incremental and others are radical changes. Indeed, instead of distinguishing between CI and innovation, it may be more useful to differentiate between continuous innovation (often small scale) and discontinuous innovation (often large scale) (Conti *et al.* 2003, pp.120-121).

Apart from depicting CI in process terms, Chung (1999) believes that CI is a philosophy of the ceaseless pursuit of perfection: ‘this philosophy shapes an individual’s value systems, provides guidelines for the person’s thoughts and behaviours, and reflects how he/she visualises the external world and the internal (i.e. inner) self.’ The attitude of ‘pursuing the last grain of rice in the corner of the lunchbox’ (Hayes 1981 in Chung

1999) helps to explain Japanese thinking and the ambition to hunt for impossible perfection. Japanese CI philosophy is also exemplified by the zero defect and JIT concepts (Chung 1999).

Taking these views and definitions into account, Continuous Improvement (CI) in this research will be defined as **‘an effort to continuously seek and make change(s) for the better through processes which can be characterised as either incremental or radical transformation and maintain the results.’** Figure 2.2 shows the effect on business performance of this comprehensive CI concept, adapted from Imai (1986).

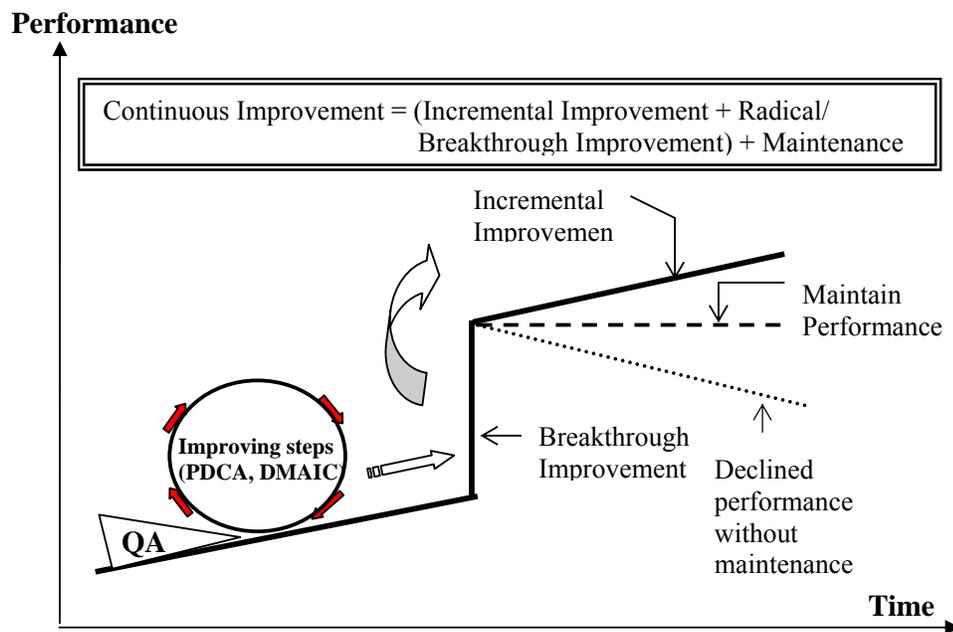


Figure 2.2: Processes of Continuous Improvement, Adapted from Imai (1986)

## 2.2 The development of CI approaches through ‘quality waves’

Having established the scope and definition of the CI concept, this section will consider its key themes and their development. CI in the key operating dimensions such as cost, quality, productivity, flexibility, and process innovation is nowadays considered an essential strategy, to gain and maintain competitive advantage in operations (Hayes *et al.* 2005; Swinehart *et al.* 2000). When the concept of CI was first introduced in the early days of modern Quality Management (QM), it was then associated with Kaizen in a manufacturing environment. Quality Management itself is a term referring to coordinated activities which direct and control the quality of product and services of an organisation. QM typically includes the establishment of quality policy and objectives,

together with quality planning, control, assurance and improvement (British Standard Institution 2005). The scope of CI (and also QM) has been subsequently enlarged far beyond its early, shop-floor, product quality orientation to focus on organisational excellence and wider business issues. As seen above, while some still maintain that limited scope, many authors consider that the nature of the CI concept has also evolved beyond Kaizen, to incorporate innovation or breakthrough change, enabling the users to cope with the rapidly changing nature of business competition (Bessant & Caffyn 1997; Conti *et al.* 2003; Joseph & William 2004).

Today, in many organisations, CI is employed in a broad context of organisational excellence and business development. Hence, current CI approaches tend to be systematic, holistic and company-wide, and linked to corporate strategy (Boer *et al.* 2000; Conti *et al.* 2003). Bessant & Caffyn (1997) identified five stages in the evolution of CI capability as organisations progressively develop, finally leading to the path of the Learning Organisation (LO). Along with this evolution of the QM and CI concepts, a range of improvement-oriented approaches and techniques have been developed, some aiming for incremental improvement with long-term benefit, others focusing on dramatic changes and/or shorter-term results. Nevertheless, the main objective of CI implementation remains the continuous improvement of process management (Hammer 2002), hence advancing an organisation's operating performance, developing Operational Effectiveness (Drejer 2006), and organisational excellence, ultimately leading to enhanced stakeholder satisfaction. This section reviews the development of CI initiatives in the context of the evolution of QM, briefly describes key concepts of these initiatives, and outlines the dominant suggested CI approaches from the current academic discourse.

### ***2.2.1 The evolving QM and CI agendas***

Throughout the 1980s and 1990s, effective QM represented a key competitive advantage for a number of leading companies such as Toyota, Motorola, AT&T, Hewlett-Packard, and Xerox (Hayes *et al.* 2005). QM concepts were developed in parallel with the evolution of new operations management ideas, the emergence of new quality-related techniques, and developing IT possibilities. QM evolution can be divided into four major phases or stages: (1) Inspection, (2) Statistical Process Control,

(3) Quality Assurance, and (4) Strategic Quality Management (Garvin 1988; Rommel 1996; Dahlgaard 1999; Dooley 2000).

Over a decade ago, Hodgetts *et al.* (1994) depicted modern organisations as those which made a fundamental shift from a Total Quality (TQ) paradigm towards a Learning Organisation (LO) and later a World-Class organisation (a term that is no longer so fashionable). Later authors have extended this theme, suggesting that organisations must sustain major improvements, maintain high performance and aim towards being an ‘Excellent-Sustainable’ organisation (Joseph & William 2004). Hence, a fifth stage of development, related to QM, may now be distinguished. It emphasises the importance of the flexible organisation, responsive and able to adapt quickly to changes, responding to customer feedback and benchmarking against competitors. Table 2.1 summarises the action, focus, methods & concepts and other characteristics of each quality era.

**Table 2.1: Five major phases of quality evolution (Adapted from Garvin 1988)**

Stages of Quality Movement					
Identifying Characteristics	Inspection	Statistical Quality Control	Quality Assurance	Strategic Quality Management	Competitive Continuous Improvement
Scope	Product Quality	Process Quality	Total Quality		Excellent-sustainable organisation
Action	Reactive to quality problems		Proactive or preventing quality failure		Flexible, Responsive, Adapt quickly to changes
Focus	Conformance to specifications	Conformance to customer requirements/ engineering description	Total customer satisfaction: product, process, system assurance	Customer comes first: strategic and management	Continuously add value to organization's stakeholders
Orientation	"Inspect" quality	"Control" quality	"Build in" quality	"Manage" quality	"CI in" quality
Methods & Concepts	Gauging and measurement	Statistics: SPC Sampling Plan Process Improvement Reduce waste & cost JIT Do It Right the First Time	Management practice: QCC, TQC, TQM (Kaizen) Control Plan Capability study DOE, MSA, FMEA	CQI by integrating management practice with process improvement ISO9000 series Six Sigma Re-Engineering Lean production	Self assessment ( <i>MBNQA, EFQM, Deming prize, Balanced Scorecard</i> ) Benchmarking Product & process design ( <i>QFD, Design for six sigma-DFSS</i> ) Advanced statistics
Measure	Finished goods	In-process measurement	Entire production chain	Quality management system	Stakeholder satisfaction
Primary Concern	Inspection	Detection	Coordination	Strategic impact	Continuous Improvement
Quality Target in production	No standard	Achieve AQL		Zero Defect	
Key responsibilities	Inspector	Quality department	Active involvement of entire organization		
Operating Philosophy	craftsman to mass production	mass customization	flexible specialization		

The literature related to World Class and Excellent-Sustainable organisation has emphasised the ceaseless pursuit of perfection or CI in all operations (Hamel 2001; Swinehart *et al.* 2000; Joseph & William 2004). Although many companies now use CI for breakthrough innovation and new technology development (Sower & Fair 2005), incremental improvement is still important to achieve long-term and sustainable success. As indicated above, in the current highly competitive business environment both continual improvement and dramatic innovation must be undertaken simultaneously (Hamel 2001; Brown *et al.* 2000).

QM themes remain very significant in business, although the concept has been broadened and is now often expressed in the language of business or organisational excellence (Sun *et al.* 2004). Quality Management has been woven and absorbed into broader business management themes, developing together towards a goal of building excellent-sustainable organisations. Cole (1998) explained that:

‘By the mid-and the late 1990, quality disappeared as a major topic in the media and was less and less a focus of top management’s attention. This is a natural process manifested in the growing normalization of quality improvement as a management activity. In this process, simplified versions of the more formal and often complex quality methodologies gradually evolved.’

At the same time, the ISO 9000 series standards showed extraordinary growth and application, and represent, perhaps, one of the most remarkable international standardisation efforts ever attempted. Companies using ISO 9001 as their major QM theme are typically smaller and less developed in organisational terms, but many of them subsequently aspire to TQM or excellence awards. A broad historical perspective shows that QM and CI approaches have emerged as a number of waves, with different origins, spread, time-scales and influence. Figure 2.3 attempts to illustrate the origin of key QM and CI approaches along with the evolution of the organisational paradigm over time.

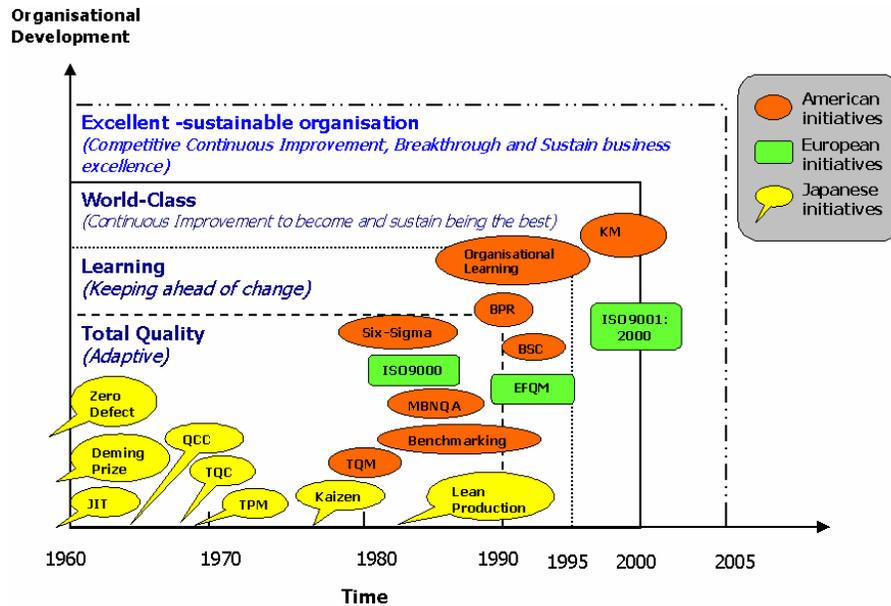


Figure 2.3: Evolution of organisational paradigm and origins of QM and CI approaches

Japan and the United States have pioneered and developed most of these methods; but they travel across the globe and have been adopted and adapted in countries with different industrial cultures. Internationally, differences in QM and CI practices and timing continue. For example, using a combination of traditional Kaizen and Lean production over the period from 1994 to 2001, Japanese automotive plants showed remarkable productivity improvement and defect rates reduction, compared with those in the United States and Britain (Oliver 2002). During the same period, the impact of BPR to force radical organisational change was felt most strongly in the USA, and to some extent Europe. Currently in the USA, Six Sigma, Lean and TQM appear to be the best-liked concepts (McNeil & Greatbank 2002; Charlesworth 2000). In Europe, the ISO 9001 and TQM are still popular, and in Asia the ISO9000, Kaizen, 5S and TQM are favourite techniques (Wheatley 1998; Bain & Company 2005b).

### 2.2.2 Contemporary Continuous Improvement Initiatives

The discussion of management themes and techniques above illustrates the development of QM and CI approaches and also raises the issue of the wide varieties of approaches leading to business improvement. This section briefly discusses the different approaches to CI and their detailed descriptions. Approaches to CI have been cited under several names, such as methods of continuous improvement or CI approaches (ASQ 2007),

business process improvement methodologies (Bendell 2005), quality approaches (Marash *et al.*, 2004), New Approaches to Operations-NAO (Hayes *et al.* 2005), best practices or best world-class (Voss 2005), business and management ideas (Greatbatch & Clark 2005; Sturdy 2004; Davenport & Prusak 2003), management tools (Rigby & Bilodeau 2005a:b), management techniques (Staw & Epstein 2000), and some authors called them management fads and fashions (Miller & Hartwick 2002; Gibson & Tesone 2001; David & Strang 2006; Carson *et al.* 2000).

The contemporary CI initiatives which may be directly related to QM are TQM, ISO9001, Lean production, Six Sigma, BPR, BE self-assessment (e.g. MBNQA, EFQM) and Benchmarking. In response to global competition in the early 1980s, the U.S. developed a fairly standardised approach called TQM. This initiative is now widely used in various organisations, being presented as a management strategy for performance improvement. Murray & Chapman (2003) state that a TQM programme would lead to a continuous improvement culture. Elements of TQM can be grouped into two dimensions – ‘management system’ or ‘soft’ part and ‘technical system’ or ‘hard’ part. Without both elements, TQM would not be successful, as shown in Tari & Sabater’s survey (2004) demonstrating that tools and techniques for quality improvement (QI) are highly correlated to TQM success. In a new direction of quality, quality awards are used as organisational self-assessment for the excellence in quality and business: Deming prize was instituted in 1951 (Garvin 1988, p.183), the Malcolm Baldrige National Quality Awards (MBNQA) was established in 1987 (Hodgetts 1993), and the European Quality Award (EQA) was introduced in 1991 (Sun *et al.* 2004). The studies by Easton & Jarrell (1998) and Hendricks & Singhal (1997) have proved that TQM firms in the U.S. show performance improvement in terms of financial performance, stock prices, quality and operating performance, especially in the long term. Nevertheless, there are some weaknesses in TQM implementation in terms of a lack of structured improvement method, lack of appointed tools to be utilised, and lack of formalised training. Thereafter a better-structured programme has been introduced under the name of Six Sigma.

Six Sigma, which recently became the most prominent programme in the U.S., was promoted as an engine to drive business performance and organisational transformation (Adam *et al.* 2003; Smith & Blakeslee 2002; Bhote 2002, 2003; Pande 2000). Six

Sigma is known as a set of methodologies (Define, Measure, Analyse, Improve, and Control or DMAIC) and techniques aiming to reduce process variation, cycle time and waste. Statistically, Six Sigma is a specific measure of quality- namely 3.4 defects per million opportunities (DPMO). It is so effective and successful because its package is easy to implement and it shows success from a large amount of cost savings at Motorola, GE, Honeywell, DuPont, and Dow Chemical. However, Hammer (2002) gives a rather negative feedback and identified limitations of Six Sigma efforts in the case of Bombardier Company. This author does not agree that Six Sigma is a vehicle for business transformation, because the nature of Six Sigma is project oriented, which it deploys statistical analysis tools to reveal the flaws in an existing process. Hence, Six Sigma projects concentrate on low level and small-scale activities and the aggregate projects do not contribute to larger corporate goals. Therefore dramatic breakthrough or change cannot occur. Furthermore, unlike the TQM results, the study by Goh *et al.* (2003) has proved that Six Sigma activities did not show outstanding performance on a macro scale of stock prices.

ISO 9000 series standard is an internationally recognised standard for quality management system. The first version, the ISO 9000: 1987, focused on quality control in manufacturing (Dooley 2000). The second version, launched in 1994, emphasised on quality assurance and required documentation, procedures, and evidence of compliances. Lately, the ISO 9001: 2000 was introduced as a new concept of process effectiveness and had a significant change to focus more on continuous improvement and customer satisfaction, compared with the previous versions (Zuckerman 2000; Bridget 2000). According to the ISO survey of certification in 2005 (ISO 2005), the number of certified companies to ISO 9000 series standard has rapidly increased and the total numbers of certified firms worldwide has reached almost 80,000 (see Appendix 2).

Another popular CI approach is lean. McKellen (2002) suggests that in order to continuously improve quality and productivity, organisations need to adopt and combine modern manufacturing philosophies such as Kaizen, Lean, Quick response, Agile, and Six Sigma. Lean thinking, an extended JIT principle and a developed concept from Toyota, focuses on reducing waste with an aim for improving manufacturing performance (Oliver 2002; Dahlgaard 2001; Zayko *et al.* 1997). With a combination of kaizen and lean production over the period from 1994 and 2001, the

Japanese automotive plant had higher increase in productivity and a better quality performance, compared with the United States and the United Kingdom (Oliver 2002).

For breakthrough changes, Williams *et al.* (2002), Prajogo & Sohal (2001), and Hammer (2001) suggest Business Process Reengineering (BPR) to stimulate invention and force radical organisational change. Hammer & Champy (2001) define BPR 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.’ Both incremental improvement and innovation are essential to achieve and maintain competitive advantage. Although each has a different approach, continual improvement by TQM, Six Sigma, or Lean focus on the existing system and improve its performance using a bottom-up approach, while radical change by BPR tends to start from the beginning, using top-down methods.

Widely adopted and utilised programmes related to the QM area nowadays are TQM, BPR, Change management, Six Sigma (Bain & Company 2005b), as well as ISO 9001, BE self-assessment, and Lean. All these techniques and philosophies are developed with the ambition to continuously improve in quality<sup>1</sup> and productivity<sup>2</sup>. Figure 2.4 illustrates the presently popular CI approaches in industry: TQM, ISO 9001, Six Sigma, BPR, Lean, and Business Excellence (BE) self-assessment by quality awards (e.g. MBNQA, EFQM).

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<sup>1</sup> Earlier quality gurus define quality as ‘a fitness for use’ (Juran 1962), ‘conformance to requirement’ (Crosby 1979) and ‘the total composite product and service in use that meet the expectations of the customer’ (Feigenbaum 1991, p.7). The ISO 8402 quality vocabulary and ISO9000 series defines ‘Quality’ as the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. Today the scope of quality has been extended. Five dimensions of quality by Dr.Kano (Bergman & Klefsjö 1994, p.17; Conti *et al.* 2003, pp.23-28) indicate that quality is not always sufficient to fulfil the expectations of the customers: sometimes it must exceed them, providing the exciting experiences, or so-called ‘attractive quality’.

<sup>2</sup> Productivity is a ratio to measure how well an organisation converts input resources into output of goods and services.

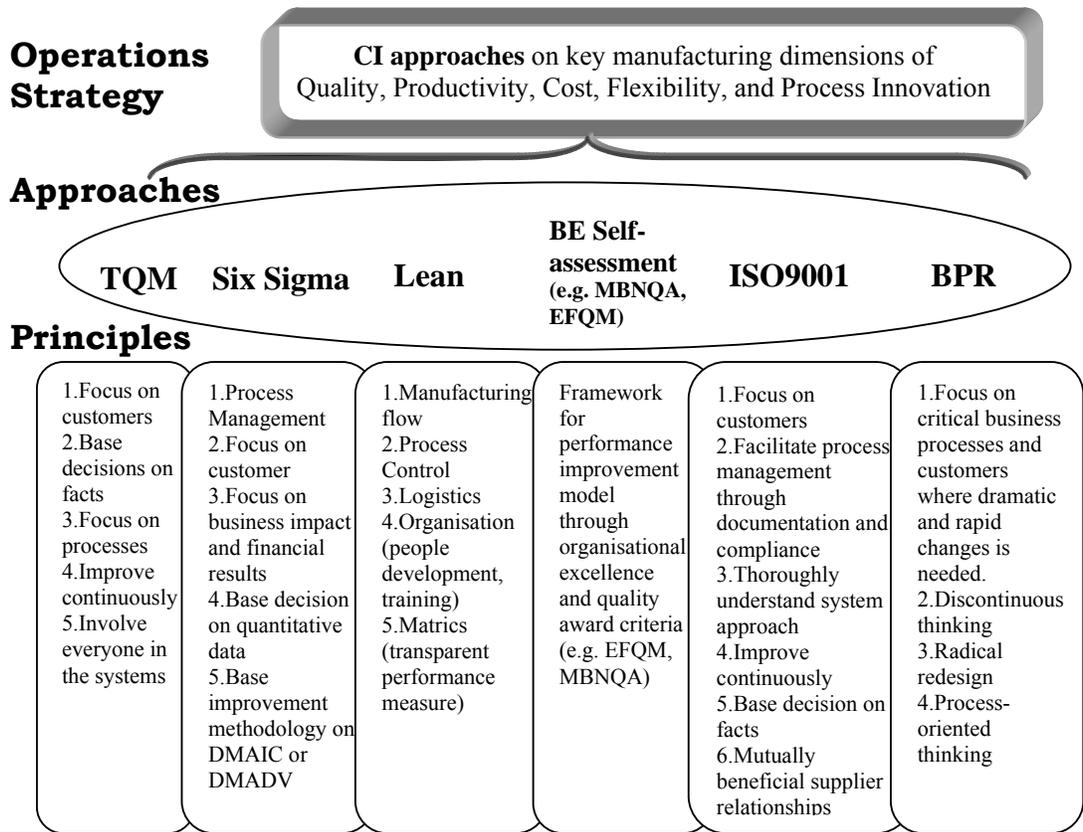


Figure 2.4: Current Continuous Improvement Approaches and Techniques

The nature of such improvements can be divided into two kinds: Incremental and Breakthrough (see Table 2.2). Incremental improvements are generally achieved through changes in and by an organisation’s infrastructure (e.g. people, systems, values and behaviour), while breakthrough improvements are generally focused on major structural changes (e.g. equipment, facilities, sourcing) (Hayes *et al.* 2005).

Table 2.2: Nature of Improvement Sought (Hayes *et al.* 2005)

Nature of knowledge base	Incremental/ infrastructural	Breakthrough/ structural
Tacit: Learning by Doing	<ul style="list-style-type: none"> <li>• Individual Learning</li> <li>• Within Group Improvement (e.g. Kaizen, PDCA, TQM, JIT)</li> </ul>	<ul style="list-style-type: none"> <li>• Toyota Production System, Long-term ‘stretch’ goals (e.g. Six Sigma)</li> </ul>
Explicit: Learning before Doing	<ul style="list-style-type: none"> <li>• Across Group Improvements; Benchmarking/ best practices</li> </ul>	<ul style="list-style-type: none"> <li>• Into Group Improvement: BPR, World-Class practices</li> </ul>

Based on these two types of improvements, the author has categorised the CI initiatives into two groups and four subgroups as follows:

1. **Direct improvement**, the activities of which directly affect the performance of the company

- 1.1 *Incremental improvements* includes TQM, ISO 9001, and Lean production
- 1.2 *Dramatic improvements* includes Six Sigma, and BPR
2. **Indirect improvement**, the activities of which support the continuous improvement agenda or act as a means to identify improvement opportunities as well as monitoring the performance of oneself and competitors.
  - 2.1 *Internal assessments* or self-assessment, which intend to give feedback on the practices and performance inside the firm, such as MBNQA, EFQM, and BSC
  - 2.2 *External assessments* or comparing oneself to customers or competitors by using the technique of Benchmarking to search for best practice and new ideas

Adopting a newly fashionable technique before understanding the core concept and the true needs of the organisation may not be the best option. From the literature of CI initiatives, the philosophy, aims, principles, methodology/roadmap, tools, strengths and weaknesses, critical success factors, and participants of each improvement programme are summarised and compared in Appendix 3 (Incremental improvement programmes), Appendix 4 (Dramatic improvement programmes) and Appendix 5 (Internal and External assessment programmes). Each CI initiative has a distinct concept, aims, methodology, tools and other specific elements, although there is some overlap. Implementing one programme does not mean the improvement in all areas of the organisation.

### **2.2.3 *Selecting and blending – the recipe for CI***

Selecting a single programme is not the only option, and indeed, many organisations feel the need to combine several initiatives. Combining one programme with another, which is expected to be complementary and produce better solutions, dominates the current literature on continuous improvement. Through what may be called the ‘CI journey’, managers and quality professionals may try to theoretically link and integrate TQM or Six Sigma programme with other approaches such as Balanced Scorecard, BE criteria, Lean and ISO 9001 (Kubiak 2003; Warnack 2003). Conti (2004) recommends that organisations need to reconcile both standardisations by ISO 9001 and differentiation by TQM or BE models. Organisations require standards to communicate and do business with others, while differentiation is used to aim at excellence. Douglas *et al.* (2003) and Magd & Curry (2003) suggest first implementing ISO 9001 (to create

stability and consistency) then introducing TQM to enhance employee motivation and operational efficiency. The Thailand Productivity Institute (TPI) (1999) also suggests applying TQM to support ISO 9001 more effectively. A statistical analysis by Sun *et al.* (2004) indicate that in Europe ISO 9001 contribute more in a highly-developed TQM environment and both are complementary to each other; however, it is not necessary to start ISO 9001 before TQM.

Numerous authors have proposed various specific 'blending recipes'. For example, Warnack (2003) and Gupta (2004) suggest that integrating Six Sigma with ISO 9001 would protect a business from improvement failure, since ISO 9001: 2000 creates the mentality of process management. Another state-of-the-art recipe for CI is to blend Lean with Six Sigma. Devane (2004, pp.8-9) points out that Six Sigma alone does not focus on improving the speed of a process, and inventory reduction, while Lean individually does not bring processes under statistical control. Lean lacks both a method for evaluating variations and a linkage between quality and statistical tools for the diagnosis of a root cause. The combination of Six Sigma and Lean allows an organisation to compensate for these missing elements (Devane 2004). Kubiak (2003) recommends integrating the BE criteria, balanced scorecard, Six Sigma and ISO 9001 for driving organisational excellence. Byrne & Norris (2003) believe that integrating Baldrige improvement initiatives with the Six Sigma ability could deliver concrete and measurable results for ongoing organisational transformation. Bhote (2003) has modified and improved the effectiveness of a Six Sigma campaign by integrating the BE self-assessment process with the Six Sigma company. Hutton (2000) considers that processing a performance measuring assessment is a crucial method while employing the Six Sigma programme. Seeing the pitfall of inability to sustain the breakthrough results, Joseph & William (2004) propose integrating the Juran Trilogy with Six Sigma in order to uphold the improvement results.

The phenomenon of integrating CI initiatives is not only suggested by many authors, but has also occurred in UK industry. A survey from 45 large organisations with over a thousand employees in UK shows that many companies which adopted Six Sigma have also implemented both ISO 9001 and TQM (Antony & Baneulas 2002). Development of a 'blending recipe' for effective Operational Effectiveness (OE), in the current

literature, mainly centres around TQM and Six Sigma programmes. Figure 2.5 depicts the ‘other ingredients’ which are typically suggested as appropriate.



Figure 2.5: Blending recipe for CI in the current literature

In the past five years, the author is not aware of any significant new initiatives which have been introduced in this field. The synthesis and development of existing approaches, the results of which process are expected to produce better solutions, dominate the current literature. According to Klefsjö *et al.* (2006), Six Sigma, an appropriate methodology within the TQM frame, should be integrated with TQM, ‘or else you may end up with too thin a soup that may separate and come apart.’ Perhaps the time is ripe for a new theme to emerge. From the Engineering Quality Forum (EQF) project survey in UK, compiled by McNeil & Greatbanks (2002), 40 percent of the respondents felt that improvement programmes have positively contributed to the objective of product quality while 28 percent believed in the opposite. They noted that there is no ‘one best way’, not all tools are appropriate and in fact too many initiatives can be confusing and if used at the same time can actually reduce the overall effectiveness.

The challenges here are how the company chooses the right approaches for their organisation, whether the selected programme suits their culture, delivers and sustain the desired results and whether their people have the capability to execute and handle the tools. Joseph & William (2004, p.7) stated two predicaments of improvement initiatives that (a) results do not occur fast enough and (b) results cannot be sustained long enough. Kaye & Anderson (1999) have demonstrated that achieving quality and continuous improvement is not easy, since there are many complex variables within an organisation. Seeing that one individual CI technique could not fully cover the CI principle, these authors have suggested ten essential criteria to support CI activities,

which are (1) management commitment, (2) leadership, (3) stakeholder focus, (4) integration of CI activities, (5) culture for CI, (6) employee focus, (7) critical processes focus, (8) Quality Management System, (9) measurement and feedback system, and (10) the learning organisation. These supportive elements for CI activities also appear in the critical success factors of some initiatives above. The reviews in section 2.2.2 have formed the preliminary factors and decision criteria for selecting CI approaches for further model development.

### **2.3 ADOPTION OF MANAGEMENT INITIATIVES**

This section provides theoretical background to the adoption of management ideas which includes the literature in general management, organisational behaviours, quality management, strategic decision-making, and operations strategy.

#### ***2.3.1 Rational and irrational theories of adoption***

The selection of management initiatives may be based on both systematic evaluation and other less rational influences including the fashion phenomenon, impulse, persuasion, power, or culture (Sturdy 2004). There are two fundamental theories regarding the adoption of management initiatives-rational and irrational. One believes that the diffusion of ideas is fluctuating like a fashion and the popularity of the idea depends on the power of the fashion setters e.g. academic gurus, consultants, and hero managers (Greatbatch & Clark 2005; Jackson 2001). Boje *et al.* (1997) stated that ‘New programmes often are introduced at points of crisis attributed to failure of the old programme or at the point that organisations worldwide including consulting firms are seeking to change for a new fashion.’ This theory of fashionable management ideas focuses upon irrational behaviour, informality, intuitive, and emotional influences in decision-making. On the contrary, general management theory, in particular the areas of strategic decision-making and operations strategy, emphasise and support the importance of a rational, structured, and systematic decision-making process.

According to Sturdy (2004), there are six perspectives on the adoption of ideas and practices which are described as follows:

1. **The rational view** describes the adoption of ideas based on objective evaluation which provides a causal link between the adopted idea and organisational performance. Characteristics of the rational view are prescriptive, pragmatic approaches, and contingent explanations.
2. **The psychodynamic view** is concerned with anxieties, yearning, and the need for autonomy and belonging, according to which management ideas are adopted without consideration of effectiveness; this opens up managerial impulsiveness and emotional influences as opposed to the rational view.
3. **The dramaturgical view** focuses on the persuasive power of agents such as ‘gurus’, consultants, academics, trainers, and authors.
4. **Political views** focus on structured interests and outcomes rather than context or relevance e.g. ideas are adopted to support individual career interests and benefits.
5. **The cultural view** can be a bridge or barrier to transfer of ideas.
6. **The institutional view** focuses on organisations securing legitimacy. New ideas are adopted for symbolic reasons (seeking peer and shareholder legitimacy).

Table 2.3 compares these perspectives.

**Table 2.3: Theoretical perspectives on the adoption of ideas and practices (Sturdy 2004)**

No	Perspective	Reason	Strength	Weakness
1	Rational	Effective for organisation	Prescriptive	Idealistic
2	Psychodynamic	Anxiety/ identity	Emotion focus	Essentialism
3	Dramaturgical	Rhetoric	Integrative	Mono-directional
4	Political	Interests/ effects	Critical	Functionalist
5	Cultural	Fits values	Contextual	Apolitical
6	Institutional	Imposed/ legitimation	Comparative/integrative	Deterministic
7	Multi-dimensional	Various	Inclusive	Non-integrative
8	Contingency	It depends	Flexibility	Relativist

Management fads have been widely and critically discussed in general management publications (Nohria *et al.* 2003; Miller & Hartwick 2002; Gibson & Tesone 2001). However, many authors have suggested that managerial audiences have become more sceptical, more conscious about fashion setting and engage in a deeper level of critical questioning about the theoretical and empirical foundations of new ideas. They have also proposed guidelines and questions to be raised, before adopting a new management idea. These suggested questions for consideration include: pay-off, endurance, company’s priorities, company’s capability and resources, cost and time to result, and organisational culture (Miller & Hartwick 2002; Gibson & Tesone 2001).

Although general management theory has created an awareness of rational decision-making and suggested some useful criteria, it does not provide a clear process and methodology to evaluate these factors. However, the theory of strategic decision-making has clarified the process. It describes decision-making based on a combination

of both a 'bounded rational' and a political process (Eisenhardt & Zbaracki 1992; Eisenhardt 1999). To increase the likelihood of a rational decision being made, more information with diverse viewpoints is required; hence, building collective intuition, stimulating constructive conflict, maintaining time pacing, and avoiding politics are the keys to strategy (Eisenhardt 1999). Two frequently-asked questions by strategic decision-makers are 'Where do you want to go?' and 'How do you get there?' (Eisenhardt 1999). The strategic decision-making theory incorporated these questions into a structured, step-by-step, and sequential process starting from identifying strategic gaps in relation to the company's internal and external environment e.g. strengths & weaknesses, opportunities & threats, then formulating objectives, identifying criteria and finally making choices (Bhushan & Rai 2004; Harrison 1999).

Matching and alignment between an action plan and organisational focus and context is an important key concern in manufacturing and operations strategy theory (Hill 1995; Platts & Gregory 1990; Slack & Lewis 2002; Voss 1995, 2005). This theory holds that the degree of fit between the chosen initiative and the company's focus and context (such as competitive priorities, capability, resource usage, etc.) has a significant impact on performance (Sousa & Voss 2001). This shows that the operation strategy thinkers would firstly and most importantly ask the question 'Where are we now?' and provide the strategic decision-makers with a tool or framework to compare action plans with the organisation's health and success as the main criteria. Three prominent frameworks for developing operations strategy which is the fit for the organisation are the Hill framework, the Platts-Gregory procedure, and the Slack & Lewis importance/performance matrix. The Hill framework proposes alignment between corporate objectives, marketing strategy and operations strategy through the customer's requirement or the competitive priorities, which are categorised into 'order winner' and 'qualifier' factors (Hill 1995). The Platts-Gregory profiling addresses the strategic choice by assessing the gap between the market requirement and the actual operational performance (Platts & Gregory 1990). The importance and performance matrix proposed by Slack & Lewis (2002) also determines the operations strategy by identifying the level of fit between marketing requirements and resource capabilities and reconciling the two.

Combining these various academic discourses has enriched understanding of the adoption phenomenon and has shaped the content for selection criteria. Table 2.4 summarises the propositions of management initiative adoption, which vary from irrational influences to a more rational and structured decision-making process.

**Table 2.4: Propositions of the adoption suggested by theories**

Adoption Influences	Theory	Researchers	Propositions of the adoption
<p><b>IRRATIONAL</b> Less structure and systematic evaluation</p>	Organisational behaviour	Greatbatch & Clark (2005), Clark (2004), Clark & Greatbatch (2004), Williams (2004), Jackson (2001), Grint (1997), Abrahamson (1991,1996)	<p><b>Fashion setters create process and supply the idea with ability to draw followers' collective beliefs</b></p> <ul style="list-style-type: none"> <li>▪ Fashion suppliers e.g. academics, gurus, consultants, hero managers</li> <li>▪ Persuasion power</li> <li>▪ Institutional theory-resembles best practices</li> <li>▪ Human intuition-past experience</li> </ul>
	General Management	Rigby & Bilodeau (2005), Nohria <i>et al.</i> (2003), Miller & Hartwick (2002), Gibson & Tesone (2001), Cagliano & Spina (2000)	<p><b>More sceptical, more conscious about fashion setting and engage in a deeper level of critical questioning:</b></p> <ul style="list-style-type: none"> <li>▪ Competitive priority, organisation's needs</li> <li>▪ Pay-off and effectiveness of the initiative</li> <li>▪ Company's capability and resources</li> <li>▪ Organisational culture</li> <li>▪ Cost and time to result</li> </ul>
	Strategic decision-making	Bhushan & Rai (2004), Eisenhardt (1999), Eisenhardt & Zbaracki (1992), Harrison (1999)	<p><b>Interweaving both bounded rational and political process.</b></p> <ul style="list-style-type: none"> <li>▪ Improve rationality, cut-off debate, and close decision by using more information, create diverse viewpoints and gain consensus agreement.</li> <li>▪ Have structured decision-making process e.g. Gap analysis, set objectives, make choice</li> <li>▪ Key decision criteria include company's vision, competitive priority, environment (technology, economic, politic, and social system)</li> </ul>
<p><b>RATIONAL</b> More structure and systematic procedure</p>	Manufacturing and Operations Strategy	Voss (1995, 2005), Tan & Platts (2003,2004), Slack & Lewis (2002), Hill (1995), Platts & Gregory (1990), Slack <i>et al.</i> (2006)	<p><b>Rigid procedure to develop strategy concerning the degree of fit to company context.</b></p> <ul style="list-style-type: none"> <li>▪ Competitive priorities or customer's requirements</li> <li>▪ Gap between market needs and operational performance</li> <li>▪ Resource capabilities</li> </ul>

In summary, the four relevant theories - organisational behaviour, general management, strategic decision-making and manufacturing and operations strategy - have provided a conceptual background to the selection factors and required process. Although strategic decision-makers may focus their decision on the company's strategic priorities, it is clear that irrational influences cannot be neglected in the overall selection decision.

Indeed they should be surfaced and if possible re-integrated into the rational decision picture. As suggested by these theories, key contents of the conceptual selection model will be composed both of irrational criteria – related to fashion setting – and rational criteria e.g. pay-offs, competitive priority, company's capability and resources, and resource consumption. However, the evidence and claims which appear to support both 'irrational' and 'rational' decision-making may still be ambiguous. Do fashions really exist in the adoption of management and improvement initiatives? If pay-off is one core criteria, what are the pay-offs from these QM and CI initiatives and which pay-offs appeal the most to managers? These issues will be explored in more detail in Chapter Four.

### ***2.3.2 Selection views of QM initiatives***

Approaches for choosing and adopting improvement programmes are varied. The British Quality Foundation survey (Charlesworth 2000), conducted in the UK, revealed that the information and selection of quality improvement approaches mostly came from customers, colleagues' recommendation, and internet searches. The 2004 ASQ survey by Weiler (2004) with responses from 603 top executives reflected a similar response: the source of information which would influence an executive to adopt a particular business improvement technique were 89 percent from conversation with peers, 77 percent from testimonial of a successful implementer, 73 percent from a case study, and 51 percent from competitors' financial results. In the United States, Bain & Company (2005a) suggested four principles for the usage of tools: 1) Get the facts e.g. strengths, weaknesses, full effects and side effects of each tool, 2) Champion realistic and strategic directions, not fleeting fad, 3) Choose the best tools for the job, and 4) Adapt tools to the business system but not vice versa. Cagliano & Spina (2000) suggested the factors that influence the choice are (1) strategic priorities, (2) past experiences on improvement programmes and (3) internal and external environment. Their research also shows that the most up-to-date programmes show lower alignment with competitive priorities, which occur in a 'fashion setting organisation' (Abrahamson 1991, 1996). This fashion phenomenon is also further explored in Chapter Four of this thesis.

Clark & Greatbatch (2004) believe that management ideas become popular not because the ideas actually work, but because they are *perceived* to be practical, beneficial and relevant. At the conceptual development stage, more accessible and reliable information which provides the mass of managers with a trustworthy perception and persuasion came from books, research papers and journal articles, which suggested benefits showed the advantage of each individual initiative (Pay-Off), perhaps in a ‘why choose me’ comparison section. Chapter Four contains the detailed pay-off study, their references, and descriptions.

### ***2.3.3 The Quality Management approach to the selection of initiatives***

Many quality management specialists: gurus, experts and consultants have provided their own approaches to QM and CI initiative selection. Some of them recommend a broad framework for business excellence (Kano 1993; Oakland 2005) but not specific proposals of ‘what to adopt’ and ‘when to adopt it’. For more directive authors, the proposed models tend towards a fixed and prescriptive type of approach; these authors mostly base their guidelines on propounding the convincing benefits of the techniques (Bendell 2005) and explain how levels of advancement in implementation will be linked to benefits gained (Ho 1999a,b; Krasachol 2000). Examples of a prescriptive path to adoption are illustrated in Figure 2.6. The decision path of business process improvement methodologies by Bendell (2005) starts from a company’s problem and links it to the initiative’s main benefit i.e. if the main issue for a company is market pressure, it should adopt ISO9001, if it is chronic waste, then Lean would be more suitable, if it is variation problem, then implement Six Sigma. When it is a people issue, Investors in People will solve it. The TQM Excellence model by Ho (1999a) suggests a sequence of adoption starting from 5S, BPR, QCC, ISO, TPM and TQM. The QM framework for Thailand by Krasachol (2000) also propose five stage of QM implementation associated with quality techniques starting from no tools in the unaware stage, to 5S, QC, GMP in the basic stage, ISO 9001, SPC, 7QC tools in the developing stage, National quality awards in the mature stage and a complete set of tools for the sustaining stage.

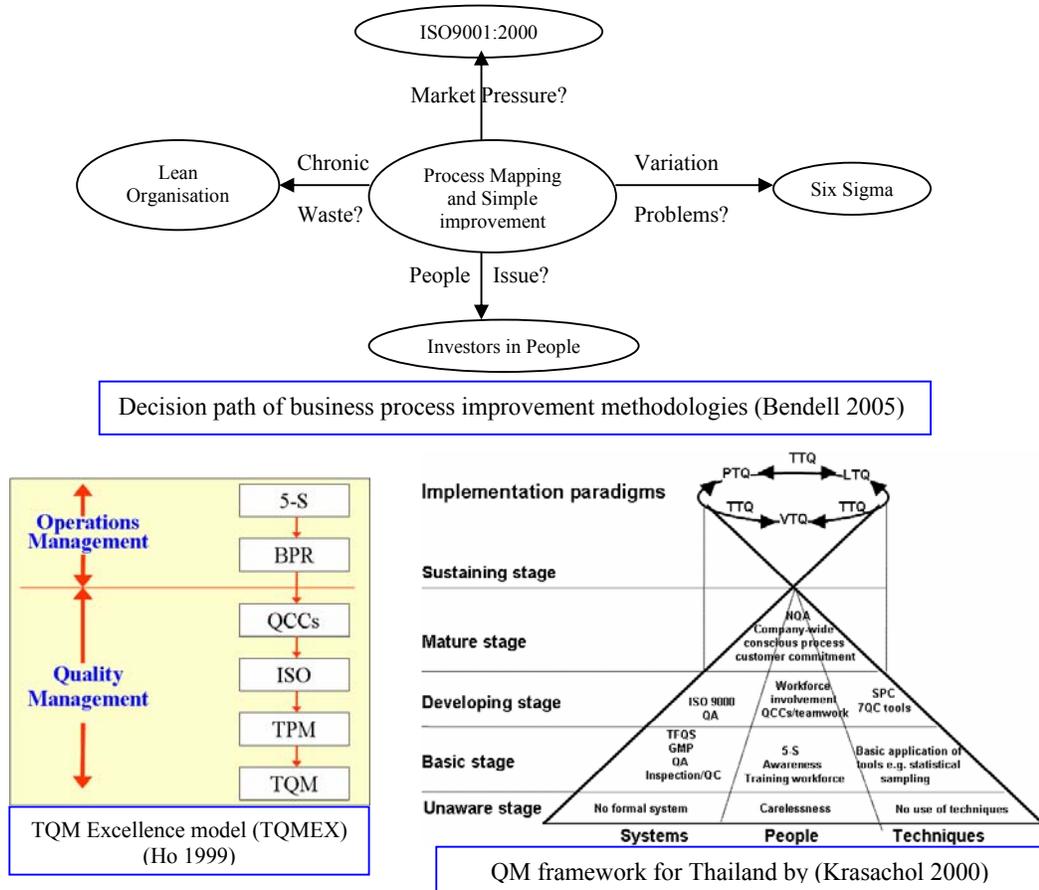


Figure 2.6: Prescriptive approach to the selection of QM techniques

In addition to using pay-offs as selection criteria, the UK Department of Trade and Industry (2004) has connected together approaches such as ISO 9001, Self-assessment, BPR, and Benchmarking, and suggested a framework for Operational Excellence. The DTI framework as illustrated in Figure 2.7 is concerned with the organisation’s direction (Vision, Mission, and Key Performance Indicators - KPIs) and the prioritisation of all activities to the company’s critical success factors. This guideline is coherent with the process of Operations Strategy concerning the match between action and operational objectives. It emphasises the importance of the organisation’s objectives in the decision about which approach to adopt.

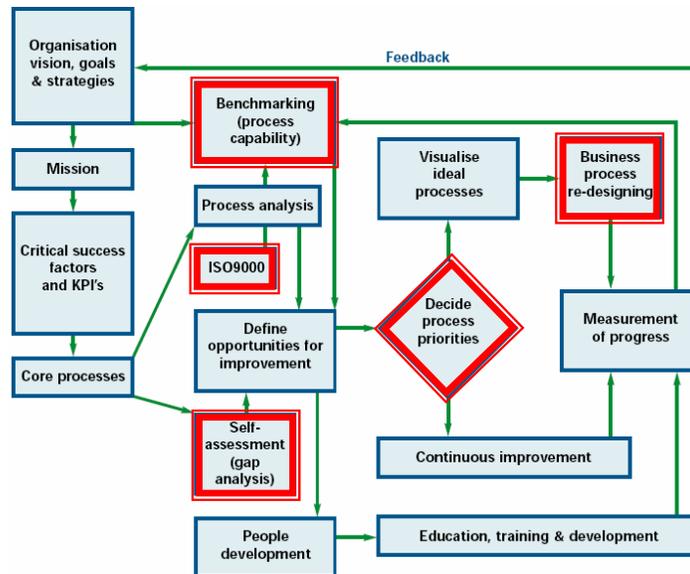


Figure 2.7: An implementation model for organisational excellence (DTI 2004)

Although these guidelines are simple and easy to follow, they could only be used as a general suggestion in an early stage of the decision, since they are not tailored to an individual company's needs and context. Other considerations and motivations for the adoption, apart from the expected pay-offs, may influence the selection decision such as the company's objectives, fashion issues, and so on. An empirical investigation of QM practices and the manufacturing strategy context by Sousa & Voss (2001) supports the position that QM practices are contingent on a plant's manufacturing strategy. Moreover, the study by Benson *et al.* (1991) has indicated that managers' perceptions of QM are influenced by the business unit including internal factors such as the degree of top management support, the organisation's past quality performance and external factor such as the degree of competition and the government regulation of quality. The adoption of QM approaches should therefore take into account the organisation's contingencies. The following section reviews the relevant literature on operations strategy, in which focuses the selection on a company's objectives and a contingency approach.

#### 2.3.4 Operations Strategy: A focus on objectives and contingency approach

Many authors in Operations Strategy literature also disagreed with a fixed and prescriptive model (Voss 2005; Hayes *et al.* 2005). The contingency or situational approach to management, which assumes that there is no universal answer to such

questions because organisations, people and situations are varied and change over time, is an assumption about selection in operations strategy (Voss 2005). Voss (2005) argues that “there is no such thing as ‘best’ practice. Practices evolve; they need tailoring to the context and time.” He suggests that the right thing to do depends on a complex variety of critical environment and internal contingencies such as circumstances, needs, requirements, capabilities, and goals in a specific situation and time. Hayes *et al.* (2005) similarly argue that there is no ‘one best way’ and a company must make appropriate decisions to fit the context within which the organisation operates. The assumption of theory in operations strategy has focused on the consistency between a company’s competitive priorities and the selected improvement programmes (Voss 2005; Hill 1995; Skinner 1969).

Fundamental characteristics of strategic management provide an organisation with a ‘sense of purpose’, ‘a sense of direction’, ‘positioning’, and ‘strategic fit’ (Hannagan 2002). Strategy in business is developed at three main levels: Corporate Strategy, Business Strategy, and Functional Strategy (e.g. operations strategy, marketing strategy, human resource strategy) (Hayes *et al.* 2005; Hill 2005; Slack & Lewis 2002). Corporate Strategy encompasses decisions regarding the overall business direction, such as investments, business positioning and development; at the business strategy level each business unit develops its own strategic direction related to the corporation, for example market positioning to achieve a competitive advantage e.g. low cost or differentiation through product or service (Hill 2005; Hayes *et al.* 2005). At the third level, the strategic role of each function in a business unit is to support the predetermined competitive dimensions and to achieve relevant performance criteria within the markets for which it is responsible (Hill 2005).

Slack & Lewis (2002) have defined Operations Strategy as, ‘the total pattern of decisions which shape the long term capabilities of any type of operation and their contribution to the overall strategy.’ Operations Strategy is an interactive process involving both planning and execution, which is distinct from the higher strategy levels that concentrate on policy development (Hayes *et al.* 2005). The formulation of operations strategy is complex and does not always follow this hierarchy view or ‘Top-down’ approach (Slack & Lewis 2002). Although Skinner (1969) and Platts & Gregory (1990) have suggested a top-down approach to manufacturing strategy, many strategic

ideas emerge over time from actual and ongoing experiences -‘Bottom-Up’ in a philosophy of continual improvement (Slack & Lewis 2002). Many authors have provided frameworks concerning the strategic fit for operations and manufacturing strategies, which are aligned with corporate strategy and set a direction for decision-making in operations (Hayes & Wheelwright 1984; Schroeder 1993; Hill 1995; and Platts & Gregory 1990). The generic operations performance objectives include quality, speed, dependability, flexibility, and cost (Slack *et al.* 2006).

Considering manufacturing objectives as a priority for action plans, Tan & Platts (2003, 2004) have developed a Tool for Action Plan Selection (TAPS) based on manufacturing strategy theory. Although TAPS is an attempt to link manufacturing objectives to action, it is limited to one aspect of selection of manufacturing objectives, and still leaves the decision task to experienced managers, who must generate the decision factors and evaluate the actions. However, QM and CI approaches should not be selected solely from manufacturing objectives, but taking account of the other factors that influence management decisions (e.g. management fashions, customers, consultants, etc.), which this research aims to explore and identify.

To date, the author is not aware of any specific research, which has been reported, on building a rational system for selecting QM and CI approaches (e.g. the consideration of factors and process for this selection purpose). However, there are suggestions of a need to provide individual companies with rational guidance when faced with various initiatives (Bain & Company 2005a; McNeil & Greatbanks 2002) and how to link them (Al-Mashari *et al.* 2001). Currently, decisions about the adoption of quality improvement initiatives often seem to be unstructured and lacking a systematic selection process. This may be due to the large number of initiatives and ideas which help create an environment of fashion, whilst in the literature, there is no clear direction or suggested approach to the selection of these ideas. Hence, best practices and their expected pay-offs, as suggested by friends, colleagues, gurus, case reports and the media influence the decisions made.

Although as discussed above the literature in the QM area has provided some guidelines for the selection of approaches from the point of views of pay-offs, such frameworks do not consider a company’s internal contingencies such as needs, capabilities and other

influences. Hence their effective utilisation is limited to the early stage of the selection decision. Conversely, the existing frameworks and processes of operations strategy are focused on company objectives without considering other factors influential for the proper selection of CI approaches. Combining the pay-offs aspect of QM initiatives with the process of operations strategy would both take into account the company's contingency and provide a clear link to the organisation's vision and mission. This is the approach taken in later chapters, and has been primarily developed based on these two existing theories.

#### **2.4 MULTI-CRITERIA DECISION-MAKING**

It has been established above that the decision to adopt QM and CI approaches should involve rationale consideration of multiple criteria. According to Bazerman (2005, p.6), 'Rationality refers to the decision-making process that is logically expected to lead to the optimal result, given an accurate assessment of the decision-makers' values and risk preferences'. It is worthwhile, therefore, to review the principles of Multi-Criteria Decision-Making (MCDM) and also the concept of a Multi-Criteria Decision Aid (MCDA). This section provides a background to these areas in order to establish the terminology used and the calculation methods in the framework. Nevertheless, the literature on decision-making is a broad subject; hence, this section only focuses on the relevant issues that are concerned with the design of the CI selection framework. According to Thompson (1967), there are four basic decision-making strategies: computational, judgmental, compromise, and inspirational. Harrison (1999) reduced them to two categories: (1) Computational and (2) Judgmental. At present, the selection of QM and CI approaches tends to consist of judgmental decision-making, based on managers' inspiration and judgment, typically without a specific set of decision criteria. The decision aid which will be described later in this thesis aims to transform this judgmental decision, which is non-programmable, and requires ambiguous judgments, to a programmable and procedural decision with support from a higher level of knowledge, using the principles of MCDM.

### 2.4.1 *Multi-Criteria Decision-making and the Multi-Criteria Decision Aid*

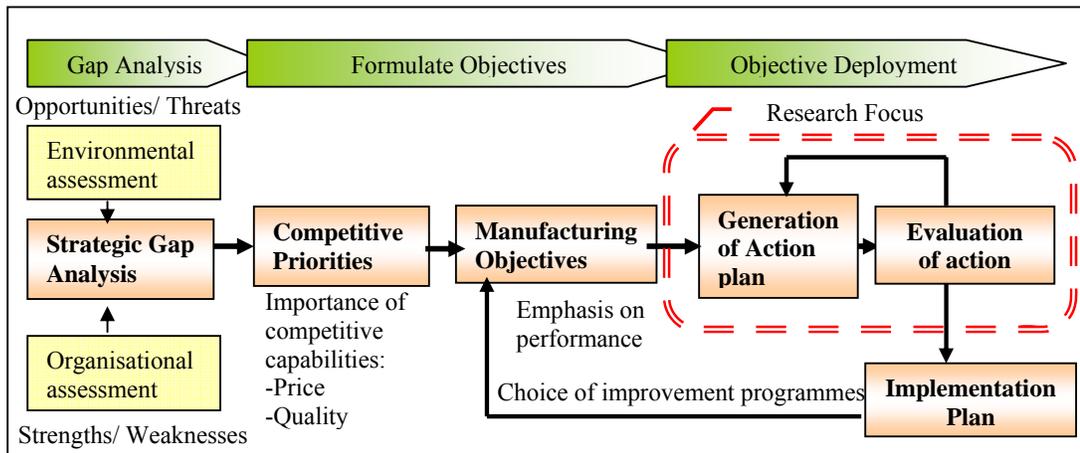
The objective of multi-criteria approaches is to help managers make better decision (Roy 1990). Seeking an optimal solution to a problem which involves multiple objectives is a goal for Multi-Criteria Decision-making (MCDM) (Triantaphyllou 2000; Daellenbach & McNickle 2005). The principle of MCDM assumes that a decision-maker is a rational person who tries to minimise their regret and losses or to maximise profit (Triantaphyllou 2000). MCDM is divided into two main theoretical studies: multi-objective decision-making (MODM) and multi-attribute decision-making (MADM) (Triantaphyllou 2000; Doumpos & Zopounidis 2002; Bhushan & Rai 2004). MODM focuses on the continuous decision space; therefore, the techniques are based on mathematical programming models such as linear programming. In this research, MADM or MCDM, which have commonly been used to mean the same class of models, is the chosen approach, because QM and CI initiative selection is a discrete decision, where there is a discrete set of alternatives and in which each can be described by some criteria. MCDM refers to models which try to find an 'optimal' or 'the most preferable' choice from the 'available' alternatives with respect to multiple criteria or attributes (Bouyssou *et al.* 2006; Daellenbach & McNickle 2005; Triantaphyllou 2000; Hwang & Yoon 1981).

The MCDM method is a model which should function within a decision support system (DSS) context to support the users to reach an optimal decision (Zanakis *et al.* 1998). T'kindt & Billaut (2006) distinguished between MCDM and MCDA: 'Multi-Criteria Decision-making is a *descriptive* approach, in which the decision is made on maximising a utility function. Multi-Criteria Decision Aid is a *constructive* approach, which is more flexible. It does not seek an optimal solution but enables the users to model the problem by using the preferences and experiences of the decision-maker, then propose an explicit choice and therefore make a decision'. The scope and objective of a MCDA is to support the decision-makers by modelling and representing their preferences, values, and policy judgment (Doumpos & Zopounidis 2002; Figueira *et al.* 2005). In MCDA, the set of decisions may evolve and a strong interaction between the decision-maker and the analyst is necessary (T'kindt & Billaut 2006). Thus, a MCDA for selecting QM and CI approaches would attempt to develop an interactive decision support model by providing a step-by-step process, developing a decision aid

framework, employing a MCDM method to evaluate the preference choices and designing graphical outputs for the analysis.

**2.4.2 The process of multi-criteria decision-making**

A core process of manufacturing strategy formulation (competitive priorities, manufacturing objectives, and action plans) such as those described by Kim & Arnold (1996), Platts & Gregory (1990), Tan & Platts (2004), and the strategic decision-making process by Harrison (1999) can be structured into three stages: Identifying the strategic gap, setting objectives, and deploying action in response to the objectives, as illustrated in Figure 2.8.



**Figure 2.8: Process of manufacturing strategy and strategic decision-making (Adapted from Platts & Gregory 1990; Kim & Arnold 1996; Harrison 1999; and Tan & Platts 2004)**

The focus and scope of the current research is limited to the process of operations strategy formulation and the strategic decision-making process as shown in Figure 2.8 with the focus on objective deployment. In the context of QM and CI initiative selection, the action plan will be based on the six approaches: TQM, BPR, ISO9001, Six Sigma, Lean, and BE.

Various processes of decision-making to evaluate multiple criteria have been proposed in the literature (for example Daellenbach & McNickle 2005; Bazerman 2005; Bhushan & Rai 2004). The number of process steps varies between three and six which typically overlap. According to Balakrishnan *et al.* (2007), the process of decision modelling includes three distinct steps: (1) Formulation (defining the problem, developing a

model, acquiring input data), (2) Solution (developing a solution, testing the solution) and (3) Interpretation (analysing the results and sensitivity analysis, implementing the results). Bhushan & Rai (2004) consider that a generic multi-criteria decision-making process involves (1) studying the situation, (2) organising multiple criteria, (3) assessing multiple criteria, (4) evaluating alternatives upon the assessed criteria, (5) ranking the alternatives, and (6) incorporating the judgments of multiple experts.

### **2.4.3 Weight Sum Methods for evaluating alternatives**

There are many MCDM methods available in the literature; however, the most widely used methods are: the weighted sum model (WSM) or simple additive weighting (SAW), the weighted product model (WPM), the analytic hierarchy process (AHP), the revised AHP, the elimination and choice translating reality (ELECTRE), and the technique for ordering preference by similarity to ideal solution (TOPSIS) method. Zanakis *et al.* (1998) have compared the performance of these methods and found that AHP and SAW behave similarly and are closer to each other than the other methods. Moreover, their ranking results do not differ significantly either (Yoon & Hwang 1995). Both WSM, a traditional and perhaps the earliest MCDM method, and AHP, a newer method introduced in Saaty (1980), are widely used by researchers and practitioners.

The WSM or SAW is a generally-used method in the literature of rational decision-making (Bazerman 2005), and management science (Daellenbach & McNickle 2005; Yoon & Hwang 1995). This method has been applied as a group decision-making technique in the field of quality management and operations management, such as the decision-matrix of Quality Function Deployment (QFD) (Akao 1990), the framework of Make or Buy decision (Platts *et al.* 2002), and concept selection in a product development project (Ulrich & Eppinger 2000, 2003). Although some authors prefer the AHP and ANP, a newer version of AHP, for group decision-making (see the evaluation by Peniwati in Saaty & Vargas 2006, p.251; Bhushan & Rai 2004), there are some pitfalls in these methods, such as ranking inconsistencies and difficulty in conducting the large number of pairwise comparisons required by AHP (see details in the study of Triantaphyllou 2000; Davey & Olson 1998). This difficulty of conducting the evaluation method is a concern in the design of a decision aid to be used by managers. The weighted sum model (WSM) or simple additive weighting (SAW) is simpler than

AHP in terms of evaluation (Triantaphyllou 2000; Zanakis *et al.* 1998). Many researchers in decision sciences and authors in strategic decision-making follow the WSM as the standard for comparisons, as it gives the most acceptable results for the majority of single-dimensional problems where the unit of multiple criteria are the same (Triantaphyllou 2000; Zanakis *et al.* 1998; Daellenbach & McNickle 2005).

A common structure of a MCDA and a WSM is drawn in a matrix form as illustrated in Figure 2.9.  $A^t$  is an alternative  $t$ ,  $V_j$  and  $W_i$  is the importance weight of the selection's criteria and sub-criteria respectively. The consequence of action  $A^t$  on criteria  $j$  and sub-criteria  $i$  is expressed as score  $S_{j,i}^t$ .

Criteria (j)	Sub-criteria (i)	Weight		Rating score for Alternatives				
		level 1 ( $V_j$ )	level 2 ( $W_i$ )	A1	A2	A3	A4	A $t$
1	1							
	2							
2	1	$V_2$	$W_1$					
	2		$W_2$					
	3		$W_3$					
...	1							
	2							

Figure 2.9: A common structure of a MCDA

To select actions or initiatives, it may be useful to employ two levels of criteria, as shown in Figure 2.9. The first level holds the main criteria, which have been referred to above as selection. The second level can then be composed of sub-criteria for each main criteria. For instance, the first level to select QM and CI initiatives might include company's objectives, pay-offs, fashion and so on. Under each main criterion, there might be a number of sub-criteria such as cost and flexibility under the main criterion of company's objectives. The decision-making managers need to agree upon the relevant criteria and their sub-criteria as objectives to select the most appropriate actions.

**2.4.4 Weighting of the criteria**

The weighting elicitation of the criteria signifies the importance that the manager attaches to each criterion or reflects the criteria's relative importance (Daellenbach & McNickle 2005). This refers to the relative importance in both criteria and sub-criteria. Not all criteria are likely to be equally important (Yoon & Hwang 1995). Therefore, the weight of each criterion and sub-criterion will reflect their relative importance. There

are many methods to carry out the weighting of criteria such as point allocation, paired comparison, trade-off analysis, regression estimates, equal weight allocation and centroid ranking (Cáñez 2000). Table 2.5 summarises the weighting methods.

**Table 2.5: Weighting methods (Cáñez 2000)**

<b>Method</b>	<b>Description</b>	<b>Comments</b>
Point Allocation	The decision-maker is asked to allocate a hundred points across the attributes. The more points given to an attribute, the greater its relative importance.	Very easy to use High trustworthiness
Paired comparison	Attributes are compared on a pairwise basis. To undertake the comparison a 9 point scale ranging from (1) equally important to (9) very much more important is recommended.	Easy to use High trustworthiness
Trade-offs	The decision-maker is provided with two choices and asked to supply a missing entry in one of two choice vectors so as to make them equally attractive. This approach derives from a set of axioms about rational choice.	Difficult to use Low trustworthiness
Regression estimates	The weights are estimated by constructing a multi regression model from the rank-ordered (1 to 100) attributes.	Moderate ease of use Medium trustworthiness
Equal or unit weighting	Equal weights are assigned to each attribute.	Very easy to use Very low trustworthiness
Centroid ranking	The decision-maker is asked to rank the attributes in order of importance, 1 being the most important. Then, the weightings are generated by using the centroid of the bounded area.	Very easy to use High trustworthiness

Point allocation has been applied in a number of quality tools such as the Quality Function Deployment (QFD), and the prioritisation matrix or the criteria rating form of CI tools (Chang 1995; Brassard & Ritter 1994) and in the process of manufacturing strategy formulation (Platts & Gregory 1990). Hence it is a familiar method to managers in the quality and operations management area. The method of point allocation is to ask managers to allocate 100 points or the numbers between 0.00 and 1.00 among the set of criteria.

#### **2.4.5 Criteria rating**

The criteria rating is to measure how well the CI approaches will achieve each of the defined criteria. The decision-makers must assess the potential consequences of each CI approach on each of the identified criteria. The Likert-type scale is the most suitable for rating the criteria for this purpose (Yoon & Hwang 1995). The five-point Likert scale is employed to rate the criteria as it is simple and the most widely used scale for criteria rating (Spector 1992; Robson 2002). The five-point scale is credited with the weights of

1,2,3,4,5 which can be described as very unfavourable, unfavourable, neutral, favourable, and very favourable (Yoon & Hwang 1995; Robson 2002). The Likert scale is an interval scale; however, ratios between scale scores have no meaning (Yoon & Hwang 1995). Moreover, the score of zero is assigned to the criteria where there is insufficient information to the rating decision. A pro forma for rating which describes how to rate the choice are provided to guide the decision-makers.

#### 2.4.6 Calculation of total score and ranking

According to the WSM or SAW, which is based on the additive utility assumption, the total value of each alternative is equal to the sum of the weighted ratings (Triantaphyllou 2000). The total score of the initiative  $t$  in the  $j^{\text{th}}$  selection's view can be calculated by (1) multiplying the rating of each criteria (score  $S_{j,i}^t$ ) by its relative importance (weight  $W_i$ ) and (2) adding all weighted rating score gives the total weighted score ( $\sum W_i S_{j,i}^t$ ).

$$T_j(t) = \sum_{i=1}^n W_i S_{j,i}^t$$

$$\text{The overall weighted score (t)} = \sum_{j=1}^m V_j T_j(t)$$

$T(t)$  = Total value of the initiative  $t$  in the  $j^{\text{th}}$  selection's view

$W_i$  = relative weight or importance of the  $i^{\text{th}}$  sub-criteria to the company

$S_{j,i}^t$  = Rating score of the initiative  $t$  to the  $i^{\text{th}}$  sub-criteria

$n$  = number of sub-criteria in the  $j^{\text{th}}$  selection's view

$V_j$  = Importance of the  $j^{\text{th}}$  selection view

$m$  = number of selection's views

The overall weighted score of initiative  $t$  is the summation of the total value of the initiative  $t$  in the  $j^{\text{th}}$  selection's view and the weight of that selection view. The most preferable initiative is the one that has the maximum overall score. The sequence of preferable choices is then ranked from the highest overall score to the lowest one. Nevertheless, this ranking should be used for further discussion rather than the final answer (Daellenbach & McNickle 2005).

### 2.4.7 Results and analysis

The weights assigned to the decision criteria reflect the importance of the criteria and hence the highest weight is believed to be the most critical one. Nevertheless, when the criteria are quantified from qualitative data or the judgment of the decision-maker, the decision-maker can make a better decision if they can determine the sensitivity of the ranking of alternatives in response to the assigned weight of the criteria (Triantaphyllou 2000). Hence, this last step of interpreting the WSM result and representing the decision-makers' preference through a variety of analyses is important for the decision aid.

The result and analysis from the WSM method can be provided in various pictorial representations (e.g. matrix diagram, profile graph). Firstly, the evaluation matrix as shown in Figure 2.9 is to assist the decision-makers to form their preference structure (Daellenbach & McNickle 2005). A spreadsheet template is widely used to facilitate this task which allows the decision-makers to see the overall evaluation and re-evaluate their relative weights and rating scores (Balakrishnan *et al.* 2007). Secondly, the performance profile of all choices displays the weighted value and attempt to provide a comparative analysis between the total weighted scores of the choices (Daellenbach & McNickle 2005). They also illustrate the dominant choices on the weighted criteria and sub-criteria. This type of performance profile has been applied in a variety of applications as a pictorial representation to assist the decision analysis such as a product profiling which illustrates the degree of consistency between the marketing and manufacturing strategy (Hill 1995; 2000), a competitive profiling (Platts 1990), and a QFD for the purpose of benchmarking (Akao 1990). These two representations can be used as a sensitivity analysis is to determine the robustness of the best choice. The sensitivity analysis examines the impact of changes in the weighted criteria and the rated alternatives against each criterion on the final ranking of the alternatives (Triantaphyllou 2000). The results of all these two techniques yield transparent and visible graphs and metrics that can be revisited for re-evaluation.

## 2.5 CONCLUSIONS

Today's successful organisations believe that they must achieve breakthrough improvements, maintain high performance by continuously improving their operations,

and plot a course towards excellence and sustainability. To simultaneously achieve these challenging goals, the selection of effective CI themes remains vital. Yesterday's solutions may not deliver competitive performance. The managers' challenge is to choose the best approach for their organisation. They must determine whether the selected approach suits their culture, delivers and sustains the desired results, and whether their people have the capability to handle the techniques. During Japan's 'quality revolution' in the 1950s and 1960s, there were relatively few choices in terms of techniques. Today, by contrast, there is a plethora of approaches and techniques to choose from. The evolving nature of CI and quality, with its developing themes, overlapping approaches and techniques can make for difficult decisions. Is it the right time to adopt Six Sigma? Is it better than TQM, and indeed what is the difference? Should we try to reengineer our business processes first? Is our ISO9001 system helping, or holding us back? These questions are increasingly significant to companies in such low-cost manufacturing countries as China, India, Vietnam, and Thailand. Not long ago, ISO certification was the main goal of most such companies. Now, many are striving to enhance their quality and productivity in order to attract strategic partners in the developed countries wishing to outsource their manufacturing capacity. Today's leading manufacturing companies take a global view of their business, and compete via their supply chains, as well as through internal operational effectiveness (OE). Their expectations of supplier OE capability are high. To become their suppliers, low-cost manufacturers must demonstrate capability in reliably producing high-quality products and services at competitive cost.

This literature review identified a clear gap in current CI initiatives and has attempted to clarify some of the background to the choice of a CI approach, explore factors and models to assist the selection process. From theories of organisational behaviour, general management, strategic decision-making, and operations strategy, explanations for the adoption of CI approaches vary from irrational power to rational justification. The international and regional differences are significant and some themes, for example TQM, remain popular in Asia, whilst their popularity has declined in other regions. According to a number of sources (literature, surveys, and research studies), Fashion setting and Pay-off (suggested benefits) are two main approaches used by many companies. Having accepted that there are some irrational influences on the selection process, a rational decision has been promoted. The literature in the QM area has

proposed somewhat rational and universal selecting criteria based on the approach's pay-offs. On the contrary, the literature in OM and OS has disagreed with the fixed model and has suggested a rational decision based on the company's objectives and situation. Both QM and OS theories have formed an initial background to the CI selection framework. However, the decision criteria for selecting CI approaches need to be identified, and a rational decision aid framework needs to be developed to assist managers when they are facing a number of improvement initiatives.

To do so, a detailed literature study of fashion setting and pay-offs is discussed in Chapter Four. In Chapter Four, the main trends and fashions in QM and CI from both academic discussions and company usage are identified and a number of publications which have claimed the programmes' effectiveness or pay-offs are summarised. Furthermore, empirical work with exceptional and leading Thai companies in Chapter Five identifies the decision criteria used for their decision to adopt particular QM and CI approaches. The theory of CI selection and the decision aid framework are further developed in Chapter Six, and Chapter Seven describes the decision aid process which is developed on the principles of MCDM as described in this chapter.

### CHAPTER 3. RESEARCH STRATEGY AND METHODOLOGY

Chapter Two reviewed the literature on Continuous Improvement approaches, the adoption and selection views of QM initiatives, and some theoretical background to the decision-making processes and decision aids. This chapter describes the research design and methodology used to fulfil the research aim and objectives. Firstly, section 3.1 discusses the theoretical foundation and justifies the chosen research philosophy. Sections 3.2 to 3.5 describe the research design and explain in detail the activities in each research phase. Finally, section 3.6 provides the justification and background of the chosen case companies and the conclusion of this chapter is presented in section 3.7.

Worldview assumptions of a research study can be divided into two major types: objectivism and subjectivism. Taken these two assumptions into details will lead to a number of research philosophies which then give a guideline to the overall research process. Generally, the framework of a research design consists of three major elements of inquiry: a) philosophical assumptions, b) strategy inquiry, and c) methods (Creswell 2003). The first element is the philosophical assumptions which explain the assumptions on which the research design is based, meaning that it defines what constitute knowledge claims. The second element is the strategy of inquiry or methodology which provides the choice or the use of method or the general research procedures e.g. survey research, ethnography, case study. The third one is the methods which are techniques and detailed procedures of data collection, analysis, and writing e.g. questionnaire, interview, and focus group. Additionally, other elements such as research approaches, time horizons, and types of data or method may also be added to provide a richer picture of the overall research design. A research design framework by Creswell (2003) could be complemented by a research onion of Saunders *et al.* (2007) which provided additional elements as mentioned above. A broad picture of a research design adapted from Saunders *et al.* (2007) can be depicted in Figure 3.1. The words in bold in Figure 3.1 represent the chosen elements in this research study and their details are explained in this chapter.

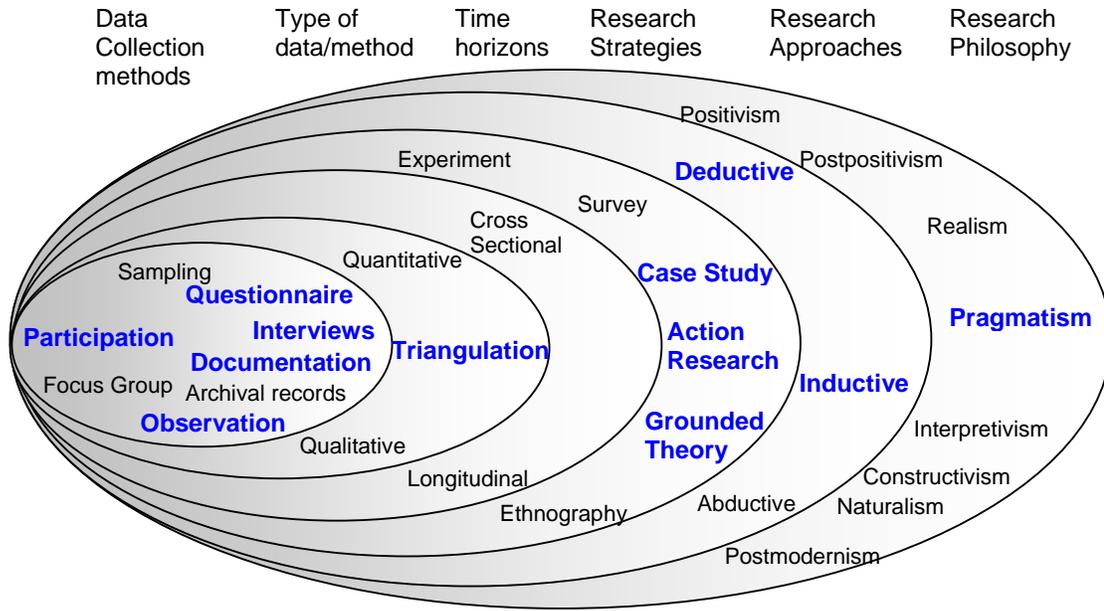


Figure 3.1: An overall picture of a research design (adapted from Saunders *et al.* 2007)

### 3.1 THEORETICAL FOUNDATION AND RESEARCH PHILOSOPHY

Understanding and positioning oneself in a specific research philosophy directs the whole research process and hence the research outcomes and knowledge claims. Knox (2004) argues that methodological pluralism is acceptable but not philosophical pluralism. Hence, this section begins with describing various research philosophies, to be followed by the author’s philosophical assumption which is related to the area of operations management (OM) research, and the research framework. Paradigms or philosophical assumptions provide the worldviews or belief systems and guide researchers to detailed modes of research (Tashakkori & Teddlie 1998; Easterby-Smith *et al.* 2002; Creswell 2003, 2007). Philosophical assumptions or knowledge claims can be described from a high objectivism (Positivism) to the mixed mode (Postpositivism, Pragmatism, or Realism) and finally to a highly subjectivism (Constructivism, Interpretivism, or Naturalism). Table 3.1 summarises the characteristics and core elements of each paradigm in detail.

**Table 3.1: Positions of Knowledge Claims and Philosophical assumption**

Elements	Paradigms or Philosophical assumptions or knowledge claims assumption			
	Objectivism	←————→		Subjectivism
	Positivism	Postpositivism	Pragmatism	Constructivism/ Interpretivism/ Naturalism
	Tashakkori & Teddlie (1998); Lincoln & Guba (1985)	Tashakkori & Teddlie (1998); Creswell (2003)	Tashakkori & Teddlie (1998); Creswell (2003); Jick (1979)	Lincoln & Guba (1985); Denzin (1989); Creswell (2003)
<b>Ontology (nature of reality)</b>	Naive realism  There is a <b>single reality</b> and apprehensible	Critical or transcendental realism  An objective reality exists <b>Reality is constructed.</b> Better reflect common understanding of both 'nature of reality' and social and behaviours.	Accept external reality (postpositivist)  Not an absolute unity Consider truth to be ' <b>what works</b> ' or <b>application and solution to problems</b> Reality is <b>multiple and constructed</b>	Ontological Relativism  Only multiple, subjective realities exist. There are <b>multiple, constructed realities</b> and they may change as their constructors change.
<b>Epistemology (how to know)</b>	Objectivism Knower and known are independent or dualism	Modified Objectivism Findings probably objectively 'true'	Both subjectivism + objectivism Knower and known must be interactive	Subjectivism The knower and the known are inseparable
<b>Axiology (values in inquiry)</b>	Inquiry is value-free	Inquiry involves value but it may be controlled. Since knowledge can be influenced by value-ladenness inquiry, and theory ladenness of facts (Value- or Theory-laden).	Values play a large role in interpreting results. Since knowledge -Can be influenced by value-ladenness of inquiry, and theory ladenness of facts -is fallible -is underdetermination of theory by fact (one set of data can be explained by many theories).	Inquiry is value-bound
<b>Generalizations</b>	Time- and context-free generalisations are possible		Time- and context-free generalisations are impossible	
<b>Causal linkages</b>	Real causes are precedent to or simultaneous with effects	Some lawful, reasonably stable relationships among social phenomena, which may be known imperfectly. Causes are identifiable in a probabilistic sense that changes over time.	May be causes and effects but never be able to pin them down	Impossible to distinguish causes from effects
<b>Logic</b>	Deductive logic	Primary Deductive logic	Deductive + Inductive	Inductive logic: 'grounded' theory
<b>Methods</b>	Quantitative methods	Primarily Quantitative	Quantitative and Qualitative methods are compatible	Qualitative methods

Research in the Operations Management (OM) field is a strongly linked to the 'real world' and often produces cross-disciplinary work (Wacker 1998). Researchers in this

field frequently have an engineering background, and so they tend to believe in the usefulness and application of scientific principles. OM research is often judged good on the basis of being practically oriented (Handfield & Melnyk 1998). Additionally, successful OM research must be accepted and applied by other researchers and managers in the field. Hence, empirical research is the cornerstone for the development of scientific knowledge in the OM field (Eisenhardt 1989; Flynn *et al.* 1990; Handfield & Melnyk 1998). However, the aim of OM research is not to create theory but to create scientific knowledge (Handfield & Melnyk 1998). Examples of scientific knowledge in the OM field according to Reynolds (1971) aim to provide: a method of organizing and categorizing 'things' (a typology), predictions of future events, explanations of past events, a sense of understanding about what causes events and in some cases, the potential for control of events (Handfield & Melnyk 1998). The nature of scientific knowledge specifically in OM research is predominantly created from rigorous process-oriented approaches through theory-building and theory-driven empirical research (Handfield & Melnyk 1998; Eisenhardt 1989; Platts & Gregory 1990).

The author's choice of research paradigm is then based upon the linkage between the nature of OM research and the aim of this research. From the nature of OM research and the aim of this research, the author's perception of the world is a combination of both subjectivism and objectivism, oriented towards practicality. Although hard science is often oriented towards positivism, OM, whose major role is to examine and solve business problems, needs to incorporate soft science or social science into its the research inquiry. Hence, pragmatism seems to be the most appropriate paradigm to explain the author's understanding of this 'real' world and it will then shape the author's research design and knowledge claims.

### **3.2 RESEARCH DESIGN**

The decision about the research design has been directed by the author's research philosophical assumptions - pragmatism, which considers truth to be 'what works' and provides solution to the problem. In pragmatism, reality is multiple and constructed. 'The mixed method approach would neutralize the biases of any single method, and provide insight into different levels or units of analysis' (Tashakkori & Teddlie 1998). In current terminology, this strategy is referred to as 'triangulation' (Brannen 1992,

p.11). Bryman (2001, p.131) and Denscombe (2003) claim that the triangulation method would enhance the research validity since it provides the opportunity to corroborate findings from different perspectives. The qualitative method will direct the quantitative method and the quantitative method gives the feedback into the qualitative discussions for further validity improvement.

Mixed model studies or Triangulation are therefore employed as a product of the pragmatist paradigm and support this research inquiry, which combines qualitative and quantitative approaches within different phases of the research process. The difference between qualitative and quantitative methods is generally described in terms of the type of data collection: the quantitative method involves numerical data and statistical analysis while the qualitative method collects descriptive data for interpretation analysis. The qualitative method focuses on patterns of inter-relationships between a previously unspecified set of concepts, while the quantitative way narrowly looks through a specified set of variables (Brannen 1992, p.4). Three main strategies of inquiry, quantitative, qualitative or mixed methods and their data collection methods are shown in Table 3.2.

**Table 3.2: Alternative strategies of research inquiry**

Quantitative	Qualitative	Mixed methods
Experimental designs Non-experimental designs e.g. Surveys	Narratives Phenomenology Ethnographies <b>Grounded theory</b> <b>Case studies</b>	<b>Sequential</b> <b>Concurrent</b> Transformative

After the strategy of triangulation was chosen for this research, the research process is then designed with the aim of answering the research objectives. This research aims for an operational framework to provide managers with a practical approach to making decisions upon various CI approaches. The scientific theory-building process (Wallace 1971, p.18) and the process research methodology for researching manufacturing strategy (Platts 1993) have similarly addressed the research steps of developing, refining and testing the framework which include both theory building and theory testing in OM research. Appendix 6 illustrates the scientific process by Wallace (1971, p.18) and Appendix 7 depicts the research structure in the OM field by Platts *et al.* (2001), which consists of context, process and content.

The research process in this study therefore included both theory building (inductive) and theory testing (deductive) to ensure the rigorous research process. The research design was divided into three phases: establishing a conceptual background, developing a selection framework, and operationalising the model. These process steps have been recommended by Platts (1993) as a process research methodology in manufacturing strategy research. The main principles of this methodology are that (1) the developed framework is adequately grounded in existing theories, (2) the framework is tested through empirical application, and (3) it is relevant and practical in application (Platts 1993).

Table 3.3 outlines the research objectives and the research process. In the first phase, the previously mentioned theories (Chapter Two) laid a general background to provide theoretical grounding of the selection framework. Detailed literature reviews were further conducted to explore and explain the existing phenomenon of CI selection and adoption. A number of publications were analysed in various ways in order to address the first and the second research objectives which lead to the development of a conceptual background. Phase two aimed to address the third and fourth objectives. It continued to investigate CI practices, identify the selection criteria, and develop a CI selection framework from three in-depth case studies and interviews with quality experts in Thailand. Thailand was chosen to be the case for this research because it is a newly industrialised country and the location for a number of multi-national companies, and Thai people are open to adopt new knowledge and technology. Hence, the question of ‘what to adopt’ is frequently asked in Thai organisations. The third phase aimed to address the final objective. It consisted of two workshops with a multi-national company and SMEs group to test and refine the proposed decision aid.

**Table 3.3: Research objectives and the research process**

<b>Research objectives</b>	<b>Research process</b>	<b>Research method</b>
(1) To investigate the approaches, activities, and trends towards continuous improvement.	Phase 1	Literature studies (Print media indicators)
(2) To determine, evaluate, and compare the differentiations and benefits of each CI approach.	Phase 1	Literature studies (Content analysis)
(3) To provide an empirical study of CI activities and their effects in the organisations; for instance, type of CI activities adopted in the organisation, outcome from implementation, obstacles, and employees' attitude.	Phase 2	Case study
(4) To identify major criteria to be considered in selecting improvement initiatives and develop a framework for selection.	Phase 2	Case Study and Interviews
(5) To develop, refine, and test a strategic decision-aid model for selecting an improvement initiative.	Phase 3	Action research and assessment questionnaire

Figure 3.2 depicts the research design and methodology. The main research strategies employed during the research inquiry include case study (Yin 2003), grounded theory (Strauss & Corbin 1998), and action research (Platts 1993).

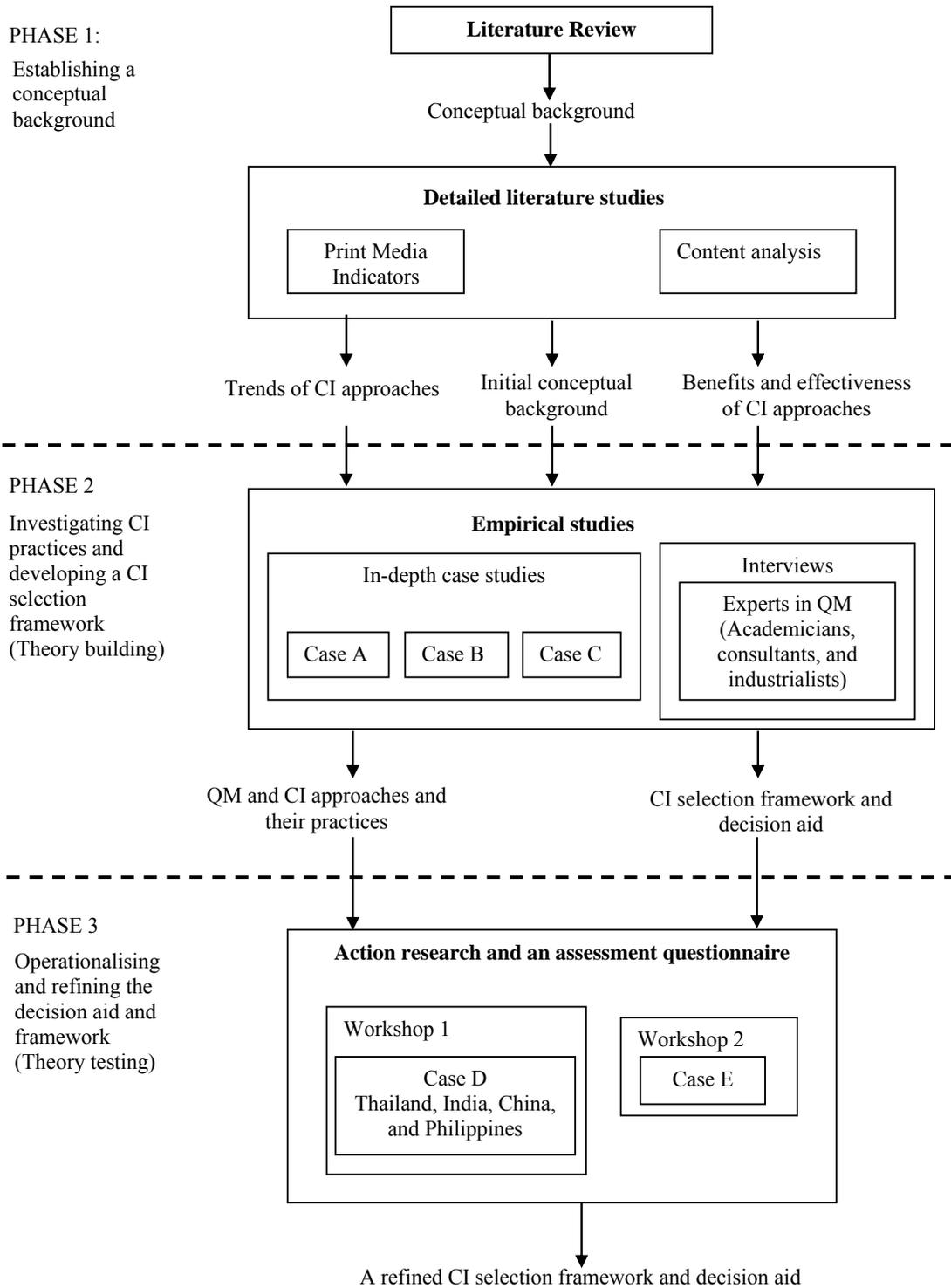


Figure 3.2: Research Design

### **3.3 Phase 1: Establishing a conceptual background**

This phase involved exploring and understanding the concept of continuous improvement, and core elements in QM and CI initiatives (TQM, ISO9001, BPR, Six Sigma, Lean, and Business Excellence model) through a study of QM theories and research in this area. The conceptual background from the literature review identified the research gap and indicated two possible criteria for the adoption: ‘fashion’ and ‘pay-offs.’ Firstly, the phenomenon of management fashion – which CI approaches are the focus – was investigated, and explained. ‘Fashion setting’ describes the phenomenon where the popularity of CI initiatives fluctuates over time. The author employed various methods in an attempt to understand this phenomenon by drawing trend graphs of CI approaches supported by empirical evidence from primary and secondary data. Three types of trend graphs were illustrated: trends in academic publication, trends in the company usage rate, and trends in CI approaches from a web search-engine. The method of ‘Print Media Indicators’, a research method to study management fashions, was employed. Secondly, content analysis on suggested benefits or the ‘why choose me’ section in the QM literature was conducted in order to summarise the benefits gained or ‘pay-off’ from the chosen CI initiatives. Key categories and contents of the pay-off were summarised. The literature was further analysed and the credibility of its claims were assessed and presented in a matrix format which showed comparisons between the selected programmes in terms of ‘pay-off’.

#### **3.3.1 *Print Media Indicators (PMI) and company usage***

‘Print Media Indicators’ is a quantitative empirical research method to reveal the lifecycle and impact of management ideas. This research method is based on the assumption that the number of publications on a selected concept reflects managerial interest in the concept over a period of time (Benders *et al.* 2006). PMI or so called citation ‘hits’ in electronic databases have been used to illustrate the popularity of a concept especially in the area of studying ‘management fashion’ or ‘organisation concepts’ (Abrahamson 1991, 1996; Abrahamson & Fairchild 1999; Benders & van Veen 2001; Jackson 2001). The data from PMI show the non-accumulative number of articles published through time and its graphs reflect the rise and fall of the popularity of an idea as well as implicitly showing the diffusion among academicians or the fashion creator side.

The PMI method is heavily reliant on bibliographic databases (Benders *et al.* 2006); hence, the author started with a pilot study by examining the database composition and their search function. Moreover, throughout the pilot study the author consulted librarians in the University of Nottingham about the usage of online academic databases and the validity of the PMI method. Online academic databases which are relevant to the field of operations management and cover publication on CI approaches include ABI/Inform- a precursor to ProQuest Direct (PQD), Business Source Premier (EBESCO), Web of Science, Zetoc and Recent Advances in Manufacturing (RAM). The justification of which database to adopt is based on 1) total number of publications on CI approaches, and 2) characteristics and functions of the database.

After the pilot study, the author decided to utilise ProQuest because the search results use multiple databases which contain more than two million documents, and it obtains a wider range and a higher number of the international publications in this particular research area compared with others. Another advantage is its advanced search function which allows users to limit the search results according to a specific date range, and keyword, and it categorises the results into scholarly journals, theses, or magazines. Figure 3.3 shows the search page of ProQuest. The author conducted the PMI method by typing the CI techniques of interest, then specifying the publication date, ranging from 1 January to 31 December in a particular year and looking for citations and abstracts of publications which fulfilled these criteria. Having understood that the search results are influenced by the specified keyword, the author used ProQuest functions such as 'and', 'or', and quotation marks to search for exact phrases and identify the publication of interest. The Microsoft Excel spreadsheet was used to compile the number of publications each year, produce trend graphs, and conduct quantitative analysis. Details of the specific data collection are further described in Chapter Four. However, ProQuest is limited to English-language publications, and hence the PMI data in this research do not reflect non-English texts. Moreover, the trend graphs of CI initiatives in this study do not cover unpublished English-language works.

**Figure 3.3: ProQuest electronic publication databases**

Clark (2004) and Swan (2004), point out that such PMI analyses examine only references to an idea in selected sections of the print media, mainly academic journals, semi-academic journals and the popular management press, rather than capturing the extent to which ideas are adopted by organisations. Hence, citation ‘hits’ may not be a good indicator of the take-up, lifecycle or impact of management ideas in business. The phenomenon of fashion adopters was then investigated through the survey of company usage rate by Bain & Company (Bain & Company 2005a). Bain & Company have already conducted a series of ten surveys in Management Tools & Trends since 1993 (no data available on 2001 and 2003) which covered over 70 countries in North America, Europe, Asia, Africa, the Middle East, and Latin America, including 7,283 respondents. Seven management tools: TQM, BPR, Six Sigma, Benchmarking, KM, Change Management, and Balanced Scorecard were selected for comparison. The linkage between fashion setters as reflected in the number of publications and fashion adopters which show in the company usage rate was also identified through quantitative and statistical analysis. A correlation analysis was conducted to find some relationship between these two sets of data from academic publications and company usage rate. The author analysed these two sets of data using both Microsoft Excel functions and SPSS version 13 in order to confirm the results.

The final trend graphs were constructed using a recent search function, ‘Google trend’, from the Google labs product. By typing in the search terms for comparison, it displays two results: 1) the frequency with which those terms have been searched for in the Google search engine and 2) the regions (city and country) that have most frequently searched for them. The results show worldwide trends in CI approaches and reflect how the idea has been disseminated through the assistance of the internet-search engine.

Although this method is a new development from the Google Company, the author conducted it only as a supplement to the evidence of trends in CI approaches.

### 3.3.2 *Content analysis*

Content analysis is ‘a research technique (scientific tools) for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use’ (Krippendorff 2004) or ‘a formal approach to convert text to numerical variables for quantitative data analysis’ (Collis & Hussey 2003). Content analysis in this phase was carried out in order to summarise and cluster the claimed benefits of the six CI approaches based on the published literature in this specific area (journal papers, books, and official publications). The relevant QM and CI literature published between 1990 and 2005 was searched through bibliography databases, and online search engines. Microsoft Excel spreadsheets and a designed matrix diagram were used as a database template to store key data (e.g. pay-off categories and sub-categories, description of the publication including author(s), year of publication, title, research method, and their pay-offs description). The selected paper was then analysed, examining key initiatives and their reported pay-offs to the organisation. A system of assessment was proposed to quantify the extent and weight of empirical evidence and estimate the strength of the claim for each pay-off. A matrix diagram was introduced which presents the extent and credibility of arguments advanced for these initiatives. The detailed data collection and analysis are explained in Chapter Four.

A prior view of general constructs or categories, and the relationships between them which satisfies the research aim is important in theory building (Voss *et al.* 2002). This phase addressed the first and second research objectives of exploring and understanding trends of CI approaches, and their key pay-offs. The outcome from this phase was a conceptual background for selecting CI approaches including preliminary decision factors and the benefits gained from their implementation based on extensive literature studies. The preliminary conceptual background in this phase was then validated and further developed through empirical studies in the following phase.

### 3.4 Phase 2: Investigating CI practices and developing a selection framework

This phase investigated CI practices and developed a preliminary CI selection model from three in-depth case studies and interviews with quality experts. It was a theory building process. The process of building a theory relies on past literature, empirical observation or experiences and insight of the researcher to incrementally build a theory (Eisenhardt 1989). Although there are various research strategies as shown in Table 3.4, the selection depends mainly on the form of research question, the degree of control over events and the focus on contemporary or historical events (Yin 1994). The relevant situation for different research strategies is described in Table 3.4. The case study is more suitable for OM research which aims for a descriptive and explanatory study and problems in OM involve many variables (Rowley 2002; Stuart *et al.* 2002; Meredith 1998). The case study is selected with the objective of answering how the companies conduct CI activities and why they decided to adopt those approaches.

**Table 3.4: Relevant situations for different research strategies (Yin 1994)**

Strategy	Form of research question	The requirement of control over events?	Focuses on Contemporary events?
Archival analysis	Who, what, where, how many, how much	No	Yes/no
Case study	How, why	No	Yes
Survey	Who, what, where, how many, how much	No	Yes
Experiment	How, why	Yes	Yes
History	How, why	No	No

#### 3.4.1 Case study

Case-based empirical study is used or recommended in many OM research studies for theory building (Eisenhardt 1989; Flynn *et al.* 1990; Platts 1993; Easterby-Smith *et al.* 2002; Voss *et al.* 2002; Stuart *et al.* 2002). A case study is a development of detailed, intensive knowledge and thick description involving an empirical investigation of a particular contemporary phenomenon and generation of rich data from a small number of situations (Eisenhardt 1989; Yin 1994; Robson 2002). Moreover, a case study allows the use of multiple data collection methods and thus enables triangulation of data which enables wider understanding of a phenomenon and increases the validity and reliability of the research findings (Jick 1979; Easterby-Smith *et al.* 2002; Yin 1994; Denscombe 2003). Denscombe (2003) summarises the characteristics of the case study as the emphasis on: (1) depth of study, (2) particular entity, (3) relationships and processes, (4)

holistic view, (5) naturally occurring phenomenon and (5) multiple sources or methods. A case study is employed as the main chosen methodology in this phase since it serves the research inquiry of ‘How are CI approaches selected and conducted?’ and ‘Why so?’ Moreover, it allows rich triangulation on the nature and pattern of CI selection, and provides in-depth empirical studies on a contemporary phenomenon within its real-life context. Eisenhardt (1989) gives three strengths of building theory from cases: ‘Firstly, it reconciles evidence across cases, types of data, and different investigators. Secondly, the emergent theory is testable, readily measurable, and can be proven. Thirdly, the resultant theory is likely to be empirically valid since the building process is adjacent to the evidence.’

There are two types of case study: ‘intrinsic’ and ‘instrumental’ case study (Stake 2006). An intrinsic or a classic case study focuses on a deep understanding of a particular social setting or case and provides rich description to describe the context in which events occur (Dyer *et al.* 1991; Meredith 1998). Beyond this classic type, an instrumental or a multi case study is widely used to build a concept or theory by focusing on comparisons across organisational contexts or cross-case analysis (Stake 2006; Eisenhardt 1989) and generalising the single case findings (Meredith 1998). Dyer *et al.* (1991) argue that although using mini-cases is useful, there are some critical trade-offs between these two such as in-depth study of a single case versus multiple cases, deep versus surface description, and telling good stories versus creating good constructs. Accepting this argument, this research conducted case studies in both ways in order to develop a deep understanding of the adoption and implementation of CI activities as well as construct a reliable CI selection framework. Intrinsic case studies were carried out with three case companies: The Siam Cement Group (SCG), Johnson & Johnson (Thailand), and PTT. These three case studies provided deep and rich descriptions of their QM and CI activities. As suggested by Stake (2006), triangulation within cases with at least three confirmations is important to assure the unbiased interpretation and triangulated case study results with various cases through interviews will ensure the rigorousness of the theory development process. Hence, the decision aid model was developed through multiple case analyses and interviews (instrumental case study). Interviews with experts including academicians, consultants, and other leading industrialists in Thailand such as Toyota Thailand, Advanced Info Service Public

Company will shed more light on the reasoning and judgement about the adoption of CI initiatives.

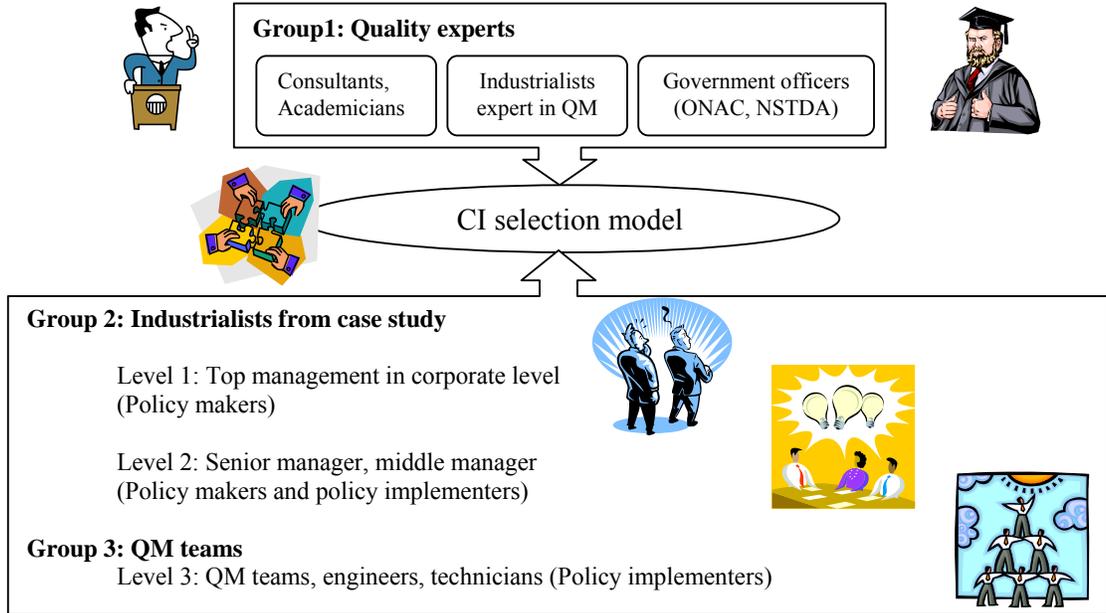
### **3.4.2 Data collection**

Within the case study, multiple sources of data, both qualitative and quantitative, were triangulated and supported the analysis. The collected qualitative data are secondary data (company annual reports, business magazines, product brochures, newsletters, newspapers, company documents, presentations, archival records and company website), and primary data were collected through interviews, observations, meeting discussions, photographs of CI activities and plant surveys. The major advantage of qualitative data collection is that it enables the researcher to obtain insights and see unexpected patterns in the data (Maylor & Blackmon 2005). In-depth case study is the most suitable methodology to understand a contemporary phenomenon (Yin 1994), and interview data enabled the researcher to seek in-depth understanding and explanations about the decisions about CI approaches and their effectiveness in current practice within the selected case companies.

A number of QM experts and organisations related to QM in Thailand were contacted for interviews including the foundation for TQM promotion in Thailand, Thailand Productivity Institute, the office of the national accreditation council, ministry of industry, and academicians. Prior to the case study, a first meeting and discussions with key contact persons at each case company identified and suggested relevant and useful people for interviews. In addition, the researcher and key contact persons in the company agreed upon the possible means of data collection, and arranged an interview timetable. Additionally, minutes of the first meetings with SCG, PTT, and JJTH are summarised. Interview was a major method in the case studies. Figure 3.4 illustrates the groups of interviewees and their level. The empirical research consisted of three groups of interviewees:

- Group 1. Quality experts including academicians, consultants, industrialists in QM, and government officers who are responsible for QM and Thai industry standard i.e. Office of the National Accreditation Council (ONAC), Ministry of Industry, National Science and Technology Development Agency (NSTDA).

- Group 2. Industrialists in the case study companies including top management and senior managers who are policy makers
- Group 3. QI teams, technicians, and engineers who are policy implementers



**Figure 3.4: The three groups of interviewees**

The interview format or a well-defined set of questions is important to guide the collection of data (Eisenhardt 1989) especially in a multi-case research study (Voss *et al.* 2002) because it will enhance the reliability and validity of the case research data (Yin 1994; Stuart *et al.* 2002). The semi-structured questionnaire was employed as an instrument for data collection in the empirical case studies and interviews. Each group of interviewees was provided with a set of different open and closed questions according to the interview’s expected outcomes. The three sets of semi-structured interview questionnaires are shown in Appendix 8, Appendix 9, and Appendix 10. The different objectives for each interview group are described in the questionnaires. The questionnaire for group 3 or QM team was translated into the Thai language in order to facilitate the interview. These questionnaires were verified for their completeness, relevance, and English and Thai language with experts in quality management. Prior to the interview, all interviewees were asked for their willingness and consent to tape recording. Each interview took between one hour and four hours. Interviewees especially with experts and top management level or the policy makers mostly took more than two hours for interviews and discussions. The list of interviewees and

duration of each interview are provided in Appendix 11. The abbreviation code and number attached to each interviewee were used to refer to the information obtained from interviews. The total number of interviewees is summarised in Table 3.5.

**Table 3.5: Total number of interviewees**

Interviewees		In-depth case studies			Interviews with experts			Total Interviews
		Siam Cement	PTT	JJTH	Industrialists		Academics/ Experts/ Consultants	
					AIS	Toyota		
Policy Makers	Group 1: Top management	7	4	3	4	2	14	47
Policy makers and deployment	Group2: Senior Managers/ Departmental managers	3	3	7	n/a	n/a		
Implementors	Group3: Technical, QI teams	41	20	9	n/a	n/a		
Total		51	27	19	4	2	14	117

During the fieldwork with case companies, on-site observations (plant tour, observe QI activities and photographs) were conducted and other supportive secondary data as mentioned above were collected. Once the data have been collected, the next step was data analysis.

### 3.4.3 Data analysis

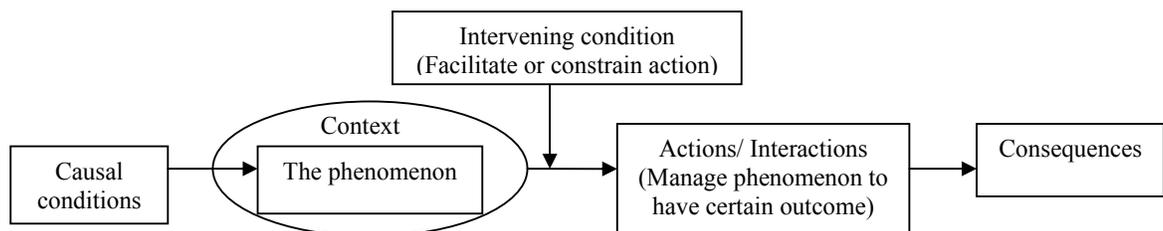
There are various ways to conduct qualitative data analysis. Yin (2003) proposes five techniques for analysing case studies: pattern matching, explanation building, time-series analysis, logic models and cross-case synthesis. These techniques were used throughout the case analysis; for instance, time-series analysis was used to describe the chronological development of CI activities in the company; pattern matching and explanation building were employed to identify replicated factors for selecting CI choices. For detailed qualitative data analysis, there are two structured ways: content analysis and grounded analysis. Both ways aim to produce common or contradictory themes, patterns, and categories from the data, which are used as a basis interpretation (Easterby-Smith *et al.* 2002). Grounded theory means a theory that was derived from data, systematically gathered and analysed through the research process. The grounded theory approach emphasises ‘practical’ rather than ‘theoretical’, and develops the theories on the basis of empirical research and collected data, and then uses inductive logic to reveal the theory behind the events (Denscombe 2003, p.109; Strauss & Corbin 1998, p.12). ‘Developing a theory by the grounded theory method will increase the

credibility of this research and new data are also unlikely to refute the theory' (Denscombe 2003). This research study analysed qualitative data partly by following the grounded theory model (Strauss & Corbin 1998), and utilised other techniques for qualitative analysis such as pattern matching, time-series, and matrices (Miles & Huberman 1994; Silverman 2000).

According to the grounded theory method, there are five steps to analyse the data: (1) coding and categorising the raw data, (2) constantly comparing the emerging codes and categories with the data, (3) checking them against new data, (4) generating concepts and theories, and (5) validating according to the practical world (Strauss & Corbin 1998; Denscombe 2003; Charmaz 2006). According to Strauss (1990) and Strauss & Corbin (1998), coding procedures in grounded theory follows (1) open coding, (2) axial coding, and (3) selective coding. Through coding the researchers make discoveries and gain a deeper understanding of the empirical world (Charmaz 2006). Terminologies used in grounded theory are described below:

'(1) Open coding is the analytic process to identify concepts, and discover their properties and dimensions from the data. Phenomena are central ideas in the data represented in concepts e.g. repeated patterns of events or actions/interaction. Categories are concepts comprising properties and dimension that stand for phenomena. Sub-categories are concepts in a category which give clarification and specification. (2) Axial coding is the process to develop categories by linking sub-categories and relating categories. (3) Selective coding is the process of integrating and refining the theory.' (Strauss & Corbin 1998, p.101-143)

The phenomenon of 'how CI approaches were adopted' was developed according to these three steps and it was described in a paradigm model (Strauss & Corbin 1998, pp.127-136). The paradigm model is used to relate subcategories to a category in axial coding as illustrated in Figure 3.5.



**Figure 3.5: The paradigm model in axial coding**

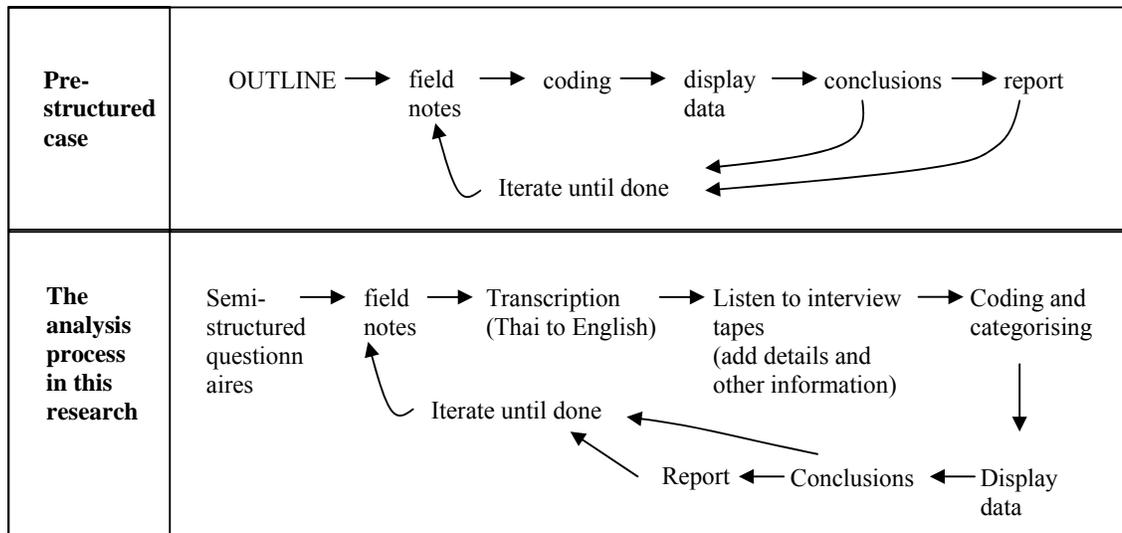
Additionally, Silverman (2000, p.86) suggested five elements for theorizing about data:

‘(1) chronology or gathering data over time in order to look at processes of change, (2) context or considering how data are contextualised in particular organisational settings, (3) comparison or dividing data into different sets and comparing each, (4) implications or thinking how to relate the findings to broader issues, (5) lateral thinking or exploring the relations between diverse models, theories, and methodologies.’

Overall qualitative analysis consists of three activities: data reduction, data display, and conclusion drawing or verification (Miles & Huberman 1994):

‘Firstly, data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions. Secondly, a display is an organized, compressed assembly of information that permits conclusion drawing and action. Thirdly, conclusion drawing describes the meanings that emerge from the data which have to be tested for their validity (Miles & Huberman 1994, p.10-12).’

Figure 3.6 describes the analysis sequence of a pre-structured case as summarised by Miles & Huberman (1994) and the analysis process conducted in this research.



**Figure 3.6: Analysis sequences**

A number of matrices were used throughout the case studies analysis in order to organise the data from interview transcriptions and field notes. Moreover, their displays were used for drawing first conclusions analysis including clustering and noting patterns of the criteria for selecting CI approaches, developing the adoption themes, counting numbers of interviewees who agreed on the sub-theme, and comparing the adoption of CI initiatives and their activities across case companies. Clustering is a process of grouping, categorising, and conceptualising objects that have similar patterns or

characteristics in order to understand a phenomenon (Miles & Huberman 1994). A large number of agreements on the selection criteria and the great number of case studies that show replication in the adoption criteria increase the reliability of the established CI selection framework (Rowley 2002; Voss 2002).

The preliminary CI selection framework and the findings from case studies were then rechecked with key interviewees, documents from case companies, the written-up field notes, transcriptions, and the recorded tapes from interview to verify that the findings and conclusions were precise and grounded to the fieldwork. Moreover, a new informant who is a Master Black Belt of the tested case company was interviewed to identify replications in the motivation to adopt CI initiatives, the selection criteria, and CI practices. This method is widely known as ‘triangulation’ which confirms the findings with different sources of information in order to enhance the validity of the conclusions (Miles & Huberman 1994; Denscombe 2003; Rowley 2002).

### **3.5 Phase 3: Operationalising and refining the decision aid**

In the last phase, action research was conducted to operationalise and refine the decision aid model. Action research requires close interaction with the researcher as a facilitator within the companies. Many OM research studies have adopted this approach for theory testing and refinement (Platts 1993; Tan & Platts 2003; Unahabhokha 2005; Yee 2004; Tan 2002). Moreover, case studies may support and be used for ‘theory testing’ as well as ‘theory building’ (Eisenhardt 1989; Voss *et al.* 2002; Denscombe 2003). The case study method within the action research method was also applied to test the preliminary framework, examine, and refine the model. An assessment questionnaire was used as an instrument to evaluate and provide further suggestions for revision.

In this phase, the decision aid was proposed and empirically tested with two different groups of industrial contexts: a multi-national company and SME entrepreneurs. These two types of organisational context will provide the comparison as well as investigate the generalizability of this decision aid. The testing process was carried out by action research in form of a workshop which lasted for three hours in each group. The objective of the workshop was to test the feasibility of the decision aid and identify areas for refinement. The researcher and another local tutor acted as facilitators who

guided and structured the process. Nevertheless, the facilitators only directed the process steps of the decision aid and did not impose his/her views on the decision-makers. The workshop was conducted with Essilor, a French-owned multi-national manufacturing company, with a group comprising thirteen decision-makers from four Asia Pacific manufacturing plants (Thailand, Philippines, India, and China). Another workshop was carried out with seventeen Thai SME entrepreneurs.

After the workshop the managers were provided with an assessment questionnaire in order to validate the practicality of the decision aid. This was based on three criteria for assessment: (1) feasibility (could the process be followed?), (2) usability (how easy and appropriate the decision-aid model is to follow?), and (3) utility (how useful the decision-aid model is?) (Platts 1993). The five point Likert scale was chosen to rate these criteria. This type of assessment has been applied to a number of research studies in the manufacturing strategy area (Unahabhokha 2005; Yee 2004; Tan 2002). Descriptions of the assessment criteria and sub-criteria are explained in Table 3.6.

**Table 3.6: Assessment criteria**

<b>Feasible</b> refers to whether the decision-aid model is feasible and possible to follow	
1	<b>Availability of information</b> – Feasibility of the input information (is the information needed available?)
2	<b>Timing</b> – Time feasibility
3	<b>Participant</b> – People and participant/meeting feasibility (feasibility of getting people to join the process)
<b>Usability</b> refers to how easy and appropriate the decision-aid model is to use	
1	<b>Clarity</b> – process clarity (process concept, description and explanation are clear)
2	<b>Ease of use</b> – the process/step is easy to follow and use
3	<b>Appropriateness</b> – the process and technique are appropriate
<b>Utility</b> refers to how useful the decision-aid model is in reaching the decision and generating output. Is the decision-aid model worth following?	
1	<b>Relevance</b> – the decision-aid assisted the participants to get the output they needed
2	<b>Usefulness</b> – Usefulness of the model (is the model useful?)
3	<b>Facilitation</b> – the facilitator helped the group through the process
4	<b>Confidence</b> – confidence in the quality of the output developed from the process

In addition to the rating criteria, some open ended questions were used to obtain other feedback such as level of their confidence in the decision made by the decision aid model, and suggestions for improvement. The design of this assessment questionnaire was adapted from Tan (2002), Yee (2004), and Unahabhokha (2005). The assessment questionnaire is illustrated in Appendix 12. The analysis from this final phase validated the robustness of the developed decision aid.

### **3.6 SELECTION OF CASE COMPANIES**

This section justifies and explains the reasons for selecting SCG, PTT, and Johnson & Johnson as case companies in the Thai context. ‘Case selection is determined by the research purpose, questions, propositions, theoretical context, and other constraints such as accessibility, resources, and time available’ (Rowley 2002). Moreover, using well-known firms with good performance records will provide representative information and hence it is worthwhile for an investigation (Stuart *et al.* 2002). The author conducted this research with the aim of shedding light on the phenomenon of initiatives adoption. A number of possible contacts among leading Thai companies were considered. Choosing appropriate cases with their willingness to collaborate with research and accessibility are important for theory building to allow key decision-making processes to be studied. SCG and PTT are exceptional and leading Thai conglomerates with a long history of adoption of modern management initiatives. PR newswire Europe limited list Thailand’s top three investments on 4 April 2005 as 1) PTT, 2) Siam Cement and 3) AIS respectively (Factiva 2005b). SCG does not only have significant history but the company has been managed by senior management with great expertise and a high recognition factor for Thai people. The case of SCG represents the manufacturing sector while PTT portrays a service industry with a strong reputation. PTT is a former Thai state-owned company. Johnson & Johnson is another leading business and a major US wholly owned multinational company in Thailand. Descriptions of all three cases, company history, business development, and their achievements were summarised, and analysed as follows.



### 3.6.1 CASE A: The Siam Cement Group

The Siam Cement Public Company Limited is one of Thailand's biggest industrial conglomerates, with five strategic business units and two holding companies. The business units include paper and packaging, petrochemicals, cement, building products, and distribution. The company also has two holding companies: cementhai property and cementhai investments. Thailand's first cement manufacturer, Siam Cement was founded in 1913 on the orders of King Rama VI (Factiva 2005a). In 1964, Siam Cement received the great honour of being named a company under Royal Patronage. In 1972, Siam Cement companies were first restructured and formed its corporate structure to The Siam Cement Group (SCG), which was responsible for directing corporate strategy and planning. Since then a white elephant in a hexagon has been used as the corporate logo. In 2005, the Siam Cement Group with a registered capital of around 250 billion baht consisted of over a hundred major companies with total export sales around 20-30 percent, and employed approximately 19,000 people (S1.1). Siam Cement not only survived such critical times as World War I, World War II, and the Asian economic crisis, but it has done well and managed to obtain many prestigious awards. Figure 3.7 illustrates the logos of SCG companies which were participated in this research.



Figure 3.7: Logo of SCG companies participated in this research

#### ▪ SCG Background

According to the company history (The Siam Cement Group 2005), the development of SCG's business during the past 92 years could be divided into five periods: foundation period (1913-73), growing period (1974-84), expansion period (1985-92), fluctuation period (1993-2000), and consolidation & sustainable growth period (2001-2005). Major changes and events at each period are summarized in Appendix 13. For the first sixty years, the author named it a foundation period since Siam Cement focused its business on producing cement, increasing its capacity, and introducing new and adjacent products under its cement category. Moreover, at that time all general managers were Danish citizens, for it took time to groom Thai nationals for the top management level

(The Siam Cement Group 2005). In the growing period, it was the first time that both the general manager, Mr. Boonwan Wongswan, and the president, Mr. Charas Xuto, were Thai. This was a sign that Siam Cement intended to grow further after learning and building a good foundation. Siam Cement started entering the pulp & paper and construction material business as a joint venture. Its cement capability was increased to over two million tons per year.

With the leadership of the next Thai president, Mr. Paron Israsena Na Ayudhya, from 1985 to 1992, Siam Cement had a big leap by expanding to several other businesses e.g. car engines, TV & home electrical appliances, sanitary ware, plastics, tyres and so on. Each year Siam Cement made more investment and started new businesses e.g. Thai Ceramic Export, Thai Container, Ceramic Floor, SC Industrial Land Company, Petrochemical Manufacturer, Siam Guardian Glass, and Siam Unit Cannery Company. In 1992, the SC Khao Wong plant was started with the most advanced production technology for the time of 3.6 million tons per year and total cement capacity reached 12.4 million tons per year. This expansion period enlarged SCG's businesses tremendously. However, the more sub-companies, the more complexity to manage. There were two big changes during this period of President Paron. First, in 1990, SCG had restructured its business into cement & refractory, marketing & trading, administration, and four core businesses: construction material, machinery and electrical products, pulp & paper, and other businesses. Second, in 1992, Total Quality Commitment or Total Quality Control – the Japanese way – was chosen and employed in SCG (The Siam Cement Group 2005).

Owning several subsidiary companies in SCG, the third Thai president, Mr. Chumpol Na Lamlieng, started restructuring SCG into four business units: cement, construction material, machinery & electrical products, and paper & petrochemicals. Since 1993, SCG has continued to expand the SC plant and moved forward overseas operations and foreign investment in five industries: cement, natural fiber, ceramic tiles, pulp and packaging, focused on Indochinese countries. Moreover, Total Quality Commitment was incorporated into corporate policy and it has been used and strongly supported as a management platform. Then again in 1995, SCG restructured its management into the corporate finance & administration and eight business groups: cement & trading, construction material, iron & steel, ceramics, electrical & metal products, machinery,

tyre & auto accessories, Petrochemicals, and Paper & container. The prosperous period of SCG was, however, unavoidably obstructed by the Asian economic crisis in 1997. With a sharp decline in sales revenues while foreign currency debts soared, and loss of investor confidence, SCG announced a major restructuring to become a more flexible and adaptable organisation with nine business units and focus on Cement, Petrochemical, and Pulp & Paper (The Siam Cement Group 2005).

Overcoming the crisis, the newly consolidated SCG has continued under the management of President Chumpol. In 2001, SCG rationalised its corporate structure down to six core businesses and two holding companies and in 2003, its ceramic business was merged into the building products unit. After consolidation, SCG has focused on each core business unit and highly qualified presidents at each unit are responsible for strengthening, improving, and sustaining its management and operating performance. The business model of SCG has shifted from a production-based cost advantage model that increased value and business differentiation by installing new machinery and equipment technology to a new model that constructs its own knowledge base organisation through innovation. Innovation at SCG means ‘developing new products, new processes, or new business models that yield a considerable benefit to the group, while satisfying customer needs.’ Hence, since 2004 SCG has announced its commitment to continuous innovation and being an innovative organisation for its long-established foundation and sustainable growth. To be an innovative organisation, SCG emphasises intellectual assets, especially developing its own skills and staff and supporting a culture of innovation (The Siam Cement Group 2005).

#### ▪ **Global recognition, awards and standards**

The business philosophy of the Siam Cement Group is ‘Quality and Fairness.’ It was incorporated and published in the code of ethics as a practical guideline for all SCG’s employees to adhere to ‘Quality and Fairness.’ Under this philosophy, each business unit has the freedom to develop their own vision and mission. For Siam Cement Industry, Mr. Pramote Techasupatkul, the president of SCI, announced the company vision of the year 2005 to pursue the ASEAN regional leader status in the cement and ready-mixed concrete business. According to this vision, SCI has placed a special emphasis on balancing the principles of ‘sustainable development’ via the three pillars

of 1) economic growth, 2) environmental conservation, and 3) social responsibility (Techasupatkul 2005).

SCG has continually received awards since 1986 with the outstanding factory award for its quality product at Siam Fiber-Cement's Bangsue plant, the U.S. Security Council award, and the Thai Industrial Standard seal. SCG continues improving its business and operations. In 1994, seven companies in SCG received ISO9002 certification. In 1995, *Asian Business Review* voted SCG as the Most Ethical & Veritable Company and in 1998 SCG received the best practices in corporate governance award from the internal auditor association of Thailand. In 2001, *Far Eastern Economic Review* voted SCG as one of the top ten companies in Thailand. Moreover, in the survey of the Thailand Management Association (TMA) and Sasin, SCG won the award for 2001 and 2004 overall corporate excellence in Thailand, commitment to Human Resource Management, commitment to product quality and service, and commitment to social and/or environmental issues. Retaining good corporate governance, in 2003 the group received numerous recognitions as the leader in this industry from both national and international organisations e.g. Reuters, Finance Asia and the Stock Exchange of Thailand. In 2004, for Best Corporate Governance, SCG was ranked as No.1 in Thailand and No.10 in Asia from the Asian Corporate Governance Association and No.1 in Thailand, No.5 in Asia and No.11 in the world from the *English Euromoney magazine* (The Siam Cement Group 2005).

Many companies in SCG have been certified ISO14001, ISO17025, TIS18001, and ISO9000 standard since the versions in 1994 and 2000. The director of TQPC has listed three prominent quality awards or achievements of TQM in SCG:

1) Deming prize in SC Thung Song in the year 2002, Thai paper and SRIC in 2003, and Thai Ceramic, CCC Polyolefins, Siam Mitsui PTA in 2004

2) Thailand Quality Award in Thai paper in 2003

3) Thailand Quality Class in SC Kang Koi, Thai paper, Siam packaging, Siam Mitsui PTA, and Capac ready mix.



The Deming prize given by JUSE is an exceptional quality award to the company which effectively practises TQM suitable to its business and management principles. Hence, SCG has shown its dedication and excellence in TQM through a number of received

Quality Awards. Additionally, SCG continually received outstanding awards for safety, occupational health, and working environment such as the Prime Minister's Industry Award in Quality Management, Safety Management and so on. With this long and successful historical background, the Siam Cement Group has continuously represented best practice and a prototype in business and operations management for many companies in Thailand.



บริษัท ปตท. จำกัด (มหาชน)

### 3.6.2 CASE B: PTT

The PTT Public Company Limited is Thailand's only fully integrated petroleum business divided into three core business groups: the Gas business Group, the Oil Business Group, and the Petrochemicals and Refining Business Group. PTT was founded in 1978 as a stated-owned fully integrated natural gas company authorized by the Petroleum Authority of Thailand to secure energy supplies during the oil crisis of the late 1970s, including exploring, developing, and producing Thailand's petroleum reserves (Datamonitor 2005b; PTT 2006a). There was a big change in 2001 when the Thai government privatised approximately one third of the company to the public in order to gain the extra funding for the exploration and development of fuel (Factiva 2005; Datamonitor 2005b). In 2003, PTT, with an initial registered capital of 28.5 billion baht, had the Ministry of Finance as the major shareholder and was supervised under the Ministry of Energy (PTT 2003a). PTT employed 5,698 people in 2005 with growing revenues of \$9.45, \$10, \$12.4, \$16.12, and \$24 billions USD in 2001, 2002, 2003, 2004, and 2005 respectively and total export sales around 30-50 percent (Factiva 2005b; Datamonitor 2005b; PTT 2003a; Analyst briefing from PTT public company limited 1 March 2005). With an experienced and strategic-led management team, PTT has managed to weather the Asian economic crisis and be able to increasingly boost its sales each year since then.



- **PTT background**

Dating back 28 years, the PTT business started from six Liquefied Petroleum Gas (LPG) terminals nationwide and a gas separation plant in Rayong. At present PTT has 16 aviation fuel depots, a network of 1,258 gas stations throughout Thailand and five gas separation plants with a processing capacity of 1,710 million cubic feet per day

(MMscfd) and a gas transmission and distribution system of over 2,600 kilometres long (PTT 2006a,b; PTT 2002). Workplaces under the gas business group can be classified into 2 groups: the gas group includes (a) gas separation plants and (b) the natural gas pipeline system, and the oil group is divided into (a) oil terminals and aviation refueling stations and (b) LPG terminal operations (PTT 2002). Their primary business activities are (1) the exploration, development and production of natural gas through PTT Exploration and Production Public Company Limited (PTTEP), (2) the procurement, transmission, processing, marketing, and distribution of natural gas and natural gas products and (3) the marketing and trading of refined petroleum products (Datamonitor 2005b). The EVP of Corporate Strategy & Planning (2005) is convinced that the continual growth of the PTT business is due to its growing market and PTT's operational synergies. The gas business is a key strength in PTT because of its completed gas value chain from integration of upstream to downstream (P1.2). PTT's entire gas value chain is illustrated in Appendix 14.

According to the company history, the development of the PTT business could be split into three periods: foundation period (1978-1991), growing period (1992-2001), and expansion period (2002-2005). Major events at each period are summarized in Figure 5.9. The first fourteen years was the foundation period for PTT since its business focused on laying the gas pipeline, constructing LPG terminals and installing the gas separation plants with the aim of strengthening Thailand's energy stability and minimizing the cost of importing petroleum (PTT 2006a; Datamonitor 2005b). In 1993 PTT became number one in Thailand's domestic oil market and this is the start of the growing period for PTT. Between 1993 and 2002 PTT installed gas separation units 3 and 4, established the first international petroleum and petrochemical R&D institute, and completed the Yadana natural gas pipeline project, Thailand's first import of natural gas from Myanmar. Also PTT signed an agreement with Petronas to jointly utilize the gas from the Joint Development Area between Malaysia and Thailand. In 2003 PTT was awarded the Best Regional Jet Fuel Marketer by Asia-Pacific Airlines, and completed the construction of gas separation unit 5 (PTT 2006a). PTT has expanded its business and invested through joint-ventures and its subsidiaries to build a regional network in Vietnam, Cambodia, Laos, Myanmar, the Philippines, Malaysia, and Hong Kong (PTT 2006a; PTT 2003a). For 14 consecutive years, PTT has remained the leading domestic LPG seller with a market share of 39 percent in 2006 (PTT 2006c).

PTT still continues expanding and focusing on its gas business with its plan to invest \$6 billion in infrastructure to enhance gas capability during 2006-2010, for which they projected 7 percent annual gas demand growth (PTT 2006c).

- **Global recognition, awards and standard**

The vision and mission of PTT is ‘To be the pre-eminent Thai energy corporation, operating a fully integrated oil and gas business, which encompasses gas-based petrochemicals and total energy services, confident of being a regional leader and a high performance organisation with accountability, integrity, and optimum stakeholder returns, within a value-driven corporate culture’ (PTT 2006a). The EVP of Corporate Strategy & Planning at PTT stated that ‘PTT’s vision is to become a World Class organisation and the priority is to develop a World Class regional leader.’ PTT aims to accomplish the following goals: (1) to solve the oil crisis, (2) to decrease imported energy, (3) to develop Thailand’s economy, (4) privatization to increase government revenue, (5) energy strategy for Thailand’s competitiveness, and (6) aim for High Performance Organisation (HPO) (P1.2).

PTT has been internationally and nationally recognised by a number of business magazines and institutions as it was ranked number one for *Asian Business Week*’s best performance, Asia’s best companies in 2005 by Finance Asia, best managed companies in Thailand by *Asia money*, best corporate governance in Thailand by The Asset and many others which were summarised and listed in Table 3.7. For QSHE achievement, PTT has been given a number of outstanding business operations awards since 1997 in productivity, environment, quality and safety and in 2004 the Rayong separation plant received a Thailand Quality Class, a second prize towards the Thailand Quality Award.

**Table 3.7: PTT’s rewards and recognition**

Rewards & recognition	Rank	Areas	Sources
<b>International recognition</b> <i>* based on PTT 2nd Quarter 2006 Analyst meeting</i>	1	Asian Business Week's Best Performance	BusinessWeek
	1	Best Managed Companies in Thailand	Asia money
	1	Asia's best companies in 2005 and 2006 in Best Managed Company in Thailand and Best in Corporate Governance in Thailand	FinanceAsia
	1	Best in Corporate Governance in Thailand	The Asset
	1	Best CEO in Thailand	Institutional Investor
	1	Best Investor Relations in thailand	
	265	World's largest corporation	2006 Fortune Global 500
	372	World's 2000 leading companies	Forbes2000
	-	Thailand's business leader of the year	CNBC
	-	Best Managed Companies in Asia	EUROMONEY
<b>National recognition</b>	-	Best corporate social responsibility, Best investor relations, Distinction in maintaining corporate governance report	SET Awards 2006
	-	Board of the year awards (02/03 & 04/05)	Thailand Institute of Directors
<b>QSHE achievement</b>		Thailand Quality Class (TQC) to Rayong gas separation plant in 2004	Thailand Productivity Institute
		ISO9001 certification (in 1998 and 2000)	
		ISO9002 certification (in 1998, 1999 and 2000)	Management system certification institute (Thailand)
		ISO/ IEC 17025 (in 1998 and 2000)	
		Productivity activities (from 1997-1998)	The technology promotion association (Thailand-Japan)
		Loss Control management, ISRS standard (1998)	Det Norske Veritas (DNV)
		TIS18000: Occupational Health and Safety standard (in 1999)	MASCI
		Safety: Outstanding performance (1998, 1999)	Ministry of Industry
		Outstanding officer and workplace (1997-2004)	Ministry of labour and social welfare
		Environmental Management System ISO 14001 certification (1998-2002)	Thai Industrial Standard Institute
			Thailand Environment Institute
			Aspects Certification Services
			Management System Certification Institute (Thailand)
		Environment: Outstanding performance (1998, 2000, 2001)	Ministry of Industry
	The Technology Energy Association		
	EIA Awards	Ministry of Science, Technology and Environment	

As Thailand’s biggest energy company, with promising business growth, PTT, a 28 year old service organisation, is a valuable case study to study both QSHE foundation and the way its path is being plotted towards being a High Performance Organisation.



**3.6.3 CASE C: Johnson & Johnson Thailand (JJTH)**

Johnson & Johnson (JJ), a US wholly owned company founded in 1886 in New Brunswick, New Jersey, is ‘the world’s most comprehensive and broadly based manufacturer of health care products, as well as a provider of related services for the consumer, pharmaceutical, and medical devices and diagnostics markets’ (Johnson & Johnson 2005). The corporation has achieved sustainable growth by concentrating on decentralised management and following the ethical principles embodied in their credo. In 2005 JJ achieved \$50.5 billion in worldwide sales which it has increased as double

digit earnings for 21 consecutive years. The more than 200 JJ operating companies employ approximately 122,000 employees in 2005 (Johnson & Johnson 2005). Johnson & Johnson Thailand was established in 1970 as one of the worldwide affiliates under the JJ Consumer Products Company specialising in baby care, consumer care, and skin care products. Figure 3.8 displays JJTH plant and its products.



**Figure 3.8: Johnson & Johnson Thailand**

#### ▪ JJTH background

In 1985, the JJTH manufacturing plant started as an operating company in Lat Krabang Industrial Estate. Four main products are produced in Thailand comprising powder, sanpro, toiletries, and oral care. The portfolio includes brands such as Johnson's Baby, Clean & Clear, Carefree, Modess, and REACH. JJTH has been selected as the regional source for sanitary protection and powder products in 1999 with average outputs of 5.3 million pads per day for sanpro and 32 tons of powder per day in 2003 (Johnson & Johnson 2003). JJTH employs 358 employees with the 2005 operating revenues of \$130 million USD and total export sales around 55-60 percent (JJTH financial department 2006).

#### ▪ Global recognition, awards and standard

The JJ Credo is the business philosophy and the guideline for all JJ affiliates as well as JJTH to follow which enables decentralised management. The JJ Credo explains the corporate ethics which focus on their responsibility to customers, employees, communities, and stockholders. The specific vision of JJTH is 'to become and be recognized by JJ affiliates, customers, and competitors as the most cost effective, flexible and reliable supply chain in Asia Pacific' (Johnson & Johnson 2003). With a

highly talented and strategic-led management team, JJTH has managed to be an efficient regional supplier and boost its double digit sales in response to the corporate financial objectives.

Unlike SCG and PTT which received many awards outside its firm, JJTH seems not too keen on making such applications. The reason may be that JJTH as a local affiliate inherits the worldwide recognition from its corporate JJ, and hence it is not necessary to put much effort on the application to local awards. In 2006 Johnson & Johnson was ranked 104th in the 2006 FORTUNE Global 500, 6<sup>th</sup> as one of the most admired companies in America, and a number of awards have received since 1991 (Johnson & Johnson 2007). Moreover, there are some assessment and recognition within the JJ companies; hence it may be redundant to their internal assessment. Some national awards which JJTH have received include the Prime Minister's Industry Award 2004 in safety management, the best workplace award 2004 in safety, health & environment from the Ministry of Labour, and 2004 good workplace from the Bangkok Governor (Johnson & Johnson 2003). The other achievements were assessed and provided by Corporate JJ or JJ own-award campaigns such as the worldwide environment excellent award, and the Standards Of Leadership (SOL) challenge awards which are given to JJ affiliates that show strength in five areas of business results (Customer/marketplace focus, Innovation, Interdependent partnering, Masters complexity, and Organisational and people development). Although JJTH is located in Thailand and employs mostly Thai people, its case shows a unique management style as a multi-national company. The quality management and process excellence is valuable to study and compare with the case of SCG and PTT.

### **3.7 CONCLUSION**

The theoretical foundation and research philosophy of this research is based upon the pragmatism paradigm, which considers truth to be 'what works' and provides a solution to the problem. The pragmatism paradigm hence shapes and directs the research design and research processes. The strategic decision aid for selecting CI approaches was developed through rigorous theory building (induction) and empirical theory testing (deduction). The research process steps were divided into three phases: establishing a conceptual background, investigating CI practices and developing a CI selection model,

and finally operationalising and refining the decision aid and CI selection framework. In the first phase, PMI and content analysis were conducted to explore trends in CI approaches and summarise their key benefits. Case study with some elements of grounded theory, and action research, is the main research strategies in this research inquiry to build and test the decision aid and CI selection framework. Methods of data collection included interviews, observation, document analysis, and questionnaires. The triangulation method with various sources of data was utilised throughout the research studies which provided a stronger validity of the generated CI selection framework and the decision aid. Three case companies of SCG, PTT and JJTH were chosen for in-depth case studies as they are the leading and exemplar practitioners of QM and CI in Thailand.

## **CHAPTER 4. ESTABLISHING A CONCEPTUAL BACKGROUND-FASHION SETTING AND PAY-OFF**

This chapter describes the first phase of the research work; the investigation of trends in improvement initiatives, management fashions, and persuasive pay-off claims, which sets the scene for the adoption process. It aims to explore and explain the adoption of QM and CI approaches from both qualitative and quantitative studies of the literature. Primary and secondary data including academic publications and other published research works are explored, extracted, and analysed in various ways to draw and describe a comprehensive background of the adoption phenomenon and the selection criteria. Firstly, section 4.1 describes the emergence of management fashions, the trends in QM and CI techniques, and provides the proof of fashion consuming as one of the main behaviours in the adoption. Secondly, section 4.2 explains and categorises the pay-offs of the six CI initiatives, using evidence from published papers. Finally, the conclusion of this chapter is presented in section 4.3, which summarises the adoption phenomena of fashion setting and pay-off.

### **4.1 FASHION SETTING AS AN ADOPTION PHENOMENON**

The area of business improvement is particularly prone to the emergence of management fashions. This section contributes to understanding of this phenomenon, supported by empirical evidence concerning Quality Management (QM) and Continuous Improvement (CI) initiatives. Quantitative evidence of the trends of academic and management discourse on these themes is presented, based on annual publication numbers for a range of important QM and CI approaches. These trends in QM and CI initiatives from the literature are then compared with reported industrial practice, using data from an international company survey conducted by Bain & Company over several years. This section concludes by discussing how these facts help to explain fashions setting in QM and CI approaches and it suggests that dissemination effects are important to global developments in these fields.

### 4.1.1 Introduction

Practitioners have long commented upon the existence of fashions in management studies. In recent years, academics seeking to understand and explain this phenomenon (Staw & Epstein 2000; Green 2004; Gibson *et al.* 2006) have relied heavily upon the theory developed by Abrahamson (1991, 1996) who conceptualised the management fashion phenomenon as having two main facets: supply (by fashion setters or producers) and demand (by fashion users or consumers). Management fashion setting is ‘...the process by which management fashion setters – consulting firms, management gurus, business mass-media publications, and business schools – continuously redefine both theirs and fashion followers’ collective believe about which management techniques lead rational management progress.’ (Abrahamson 1996). The responsibility to consciously select management fashion is placed on managers as fashion users while fashion setters create process and supply the ideas (Williams 2004). Although the author find Abrahamson’s model helpful, other authors consider that drawing distinctions between fashion setters and consumers is less valuable, that managers act as co-producers in the development of management fashions and that the fashion phenomenon has complex, irrational and paradoxical aspects and many similarities with cultural fashion (Czarniawska 2005).

Thus, Clark & Greatbatch (2004) described management fashion as an image-spectacle, which aims to supply mass audiences with ideas and techniques and so gain mass followers. They believed that a management theory becomes popular not just because the idea works, but because it is perceived to be practical, beneficial and relevant. Hence, whether an idea will successfully become a fashion, depends on the would-be fashion setters’ ability to draw followers’ collective beliefs (Clark 2004). Clark & Greatbatch (2004) also note that the life span of management fashions has, in recent years, become shorter. They suggest that managerial audiences have become more skeptical, more conscious about fashion setting and engage in a deeper level of critical questioning about the theoretical and empirical foundations of new ideas. Nevertheless, there is a persistent demand from fashion consumers (managers) keen to adopt new ideas, as they seek to obtain competitive differentiation through innovation. Hence, research into the management fashion phenomenon is worthwhile, for both fashion setters and users, since it increases awareness and understanding of the nature of management fashions and hopefully allows them to be handled more successfully.

Most previous research on management fashion phenomenon has emphasised the supply side, that is fashion creation and diffusion by fashion setters. Typically, ‘citation hits’ or Print Media Indicators (PMI) are analysed to explain the lifecycle and impact of new management ideas (Abrahamson 1991, 1996; Abrahamson & Fairchild 1999; Benders & van Veen 2001; Jackson 2001). However, such studies have provided relatively little empirical data or analysis of the behaviour of fashion users on the *demand side* (Benders & van Bijsterveld 2000) and of the relationship between supply and demand sides. Clark (2004) and Swan (2004), point out that such PMI analyses examine only references to an idea in selected sections of the print media, mainly academic journals, semi-academic journals and the popular management press, rather than capturing the extent to which ideas are adopted by organisations. Hence, citation ‘hits’ may not be a good indicator of the take-up, lifecycle or impact of management ideas in business.

This section will contribute to filling this research gap, by providing empirical evidence of the adoption of management themes and techniques associated with QM and CI and comparing these data with the citation hits for the same period. The author is also interested in addressing the international dimension – the adoption of management fashions across the globe, particularly in developing and newly industrialised countries. In particular, the author will consider the following questions. What are the trends in academic and business publication related to the various QM and CI approaches? How do patterns in company usage of these approaches compare with publication trends? What adoption patterns are seen across the globe and how do these vary for different fashions?

#### ***4.1.2 Exploring fashions using Print Media Indicators***

Publication rates in the area of CI were investigated using primary evidence, utilising the ProQuest Direct (PQD), online academic databases, to obtain quantitative PMI data against selected key word search terms. ProQuest uses multiple databases contained frequently requested international publications and is widely used in the academic, business and management worlds. A comparison of ProQuest with alternatives such as Business Source Premier (EBESCO), Web of Science, Zetoc and Recent Advances in Manufacturing (RAM), showed that it covered a wider range of publications in the area

of interest. Data relating to the period 1990-2004 was extracted in August 2005. The author is well aware that the total volume of academic and business publication has probably increased over the 14 year period considered and that on-line sources may not necessarily include all earlier output.

The initial search terms were designed to select publications for a range of recent management fashions, to gain an impression of general behaviour and comparability (Figure 4.1). Search terms were designed to elicit all articles significantly mentioning Continuous Improvement (CI), Learning Organisation (LO), Total Quality Management (TQM), Change Management, Knowledge Management (KM) and Business Process Reengineering (BPR). These terms were supplemented with appropriate acronyms and equivalent or alternative terms and spellings where necessary. The results show the number of articles published in each year and reveal the publication trends, for this group of management approaches. These data do not indicate research interest only - the publications counted included those in academic journals and articles in business publications, many of which were written by consultants and practitioners.

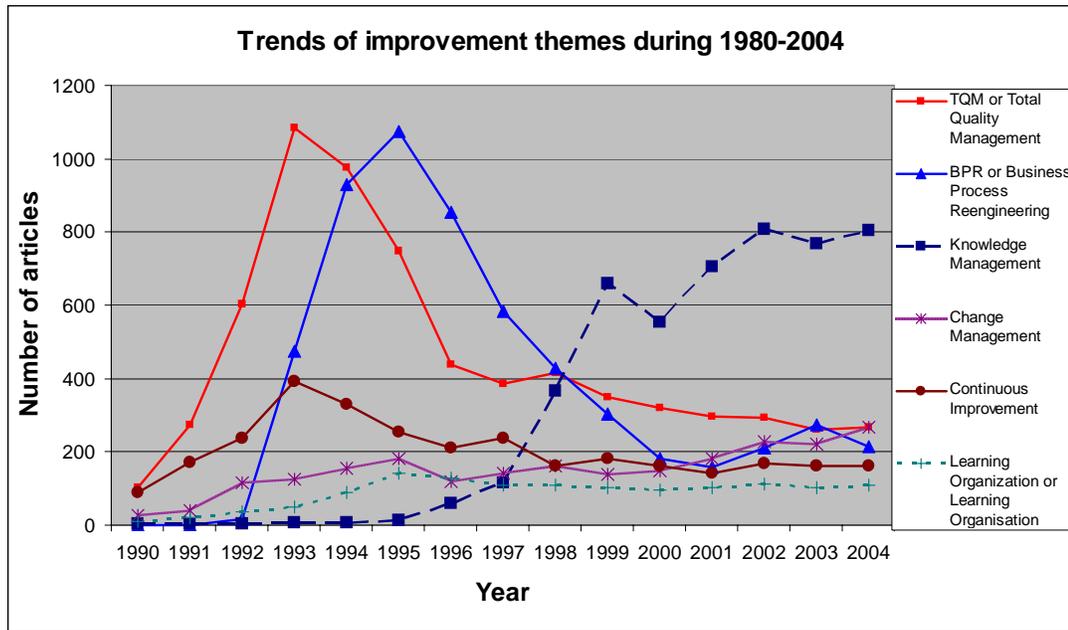


Figure 4.1: Frequency of hits and trends for Improvement Themes from ProQuest (1990-2004)

The tendency for the academic and business discourse to focus on these themes sometimes showed noticeable peaks, beyond which they appeared to decline in popularity. Two important themes, TQM and BPR, show the ‘bell-shaped’ patterns

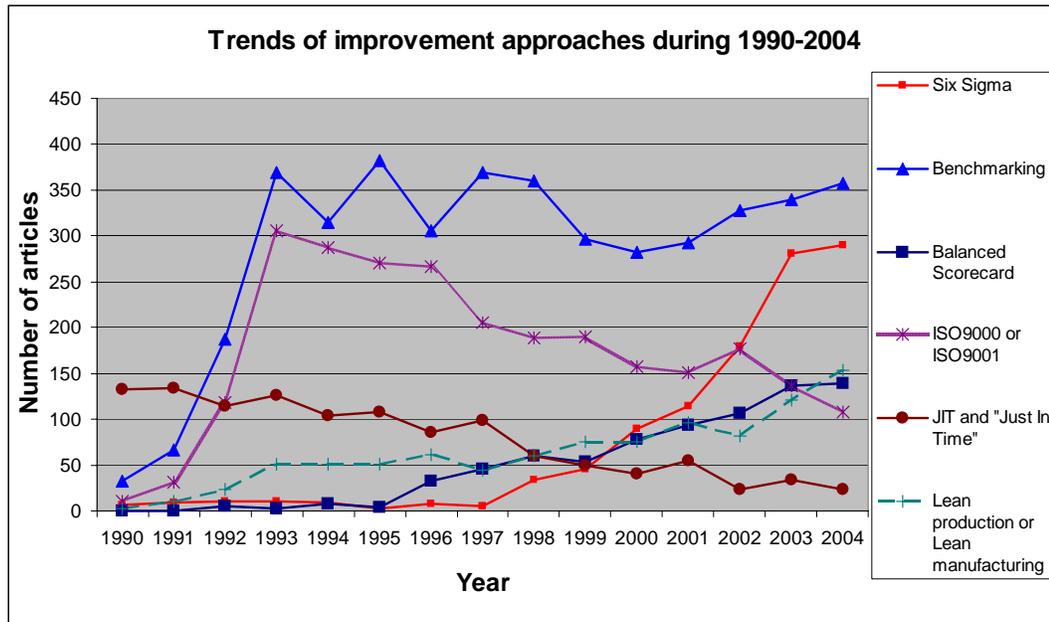
which have been noted for other management fashions, for example Quality Circles in the 1980s (Abrahamson 1996). Relatively minor tend to show less dramatic reversals of fortune. Publications referring specifically to CI reached a relatively gentle peak in 1993, at the same time as TQM but at a much lower publication volume. References to LO, which was introduced as a CI maturity goal or perhaps a further direction on the CI path (Bessant & Caffyn 1997; Boer *et al.* 2000), rose gently to a maximum in 1995, but never became as popular as CI. The data for both themes suggest a modest but sustained interest through the next nine years, although references to TQM have always remained higher than either. These three concepts were still frequently mentioned in subsequent years, with the numbers of articles declining gradually or reaching a steady-state, indicating that these themes remain of interest to academics and perhaps also to business.

The Change Management theme, which considers change initiatives, organisation and implementation of organisational change (Cameron 2004), is still gradually growing in popularity. Knowledge Management (KM) has shown a stronger increase in popularity, perhaps in response to the focus in developed countries on post-industrial economic activity and the knowledge-based economy. KM articles started emerging in quantity in 1995, but this theme has not yet attained the peak levels shown by TQM or BPR. Technology (IT and IS) plays a key enabling role in KM to build the learning organisation (Scarbrough & Swan 2001; Knight & Howes 2003). The trends in both BPR and KM themes may reflect the perceived business need to be distinctive, agile and efficient, by implementing new organisation and technologies, which enable breakthrough improvement, rather than the people and process focus of CI and LO.

#### ***4.1.3 Trends in techniques and approaches***

The distinction between the broader management themes, such as those shown in Figure 4.1 and the associated quality, improvement and excellence approaches and techniques, is sometimes difficult to make, as these categories tend to overlap and distinctions are arguable. Accepting this, the author carried out another investigation using ProQuest, this time looking for the number of citations and abstracts for a selection of improvement-oriented approaches, with the following keywords: Six Sigma, ISO9000 or ISO9001, Self-assessment and MBNQA, Self-assessment and (EQA or EFQM),

Balanced Scorecard, Benchmarking, JIT, Lean production or Lean manufacturing. Figure 4.2 shows the comparative results. Note that the absolute numbers of publication (vertical scale) in Figure 4.2 are considerably lower than those in Figure 4.1. The two composite terms related to self-assessment returned very low numbers and are not illustrated. Interest in the ISO9000 series of quality systems standards, while declining, may have been sustained by the new version of the ISO 9001 standard issued in 2000. Publication output concerning JIT was highest in 1991 and has declined ever since with only a few articles in 2004. A newer theme 'Lean', with a similar concept to JIT but a broader view, has succeeded it in popularity and the number of associated publications was still on the increase in 2004. The popularity of Six Sigma has risen noticeably since 1997, but overall levels in 2004 were not much higher than the residual publication levels concerning TQM.

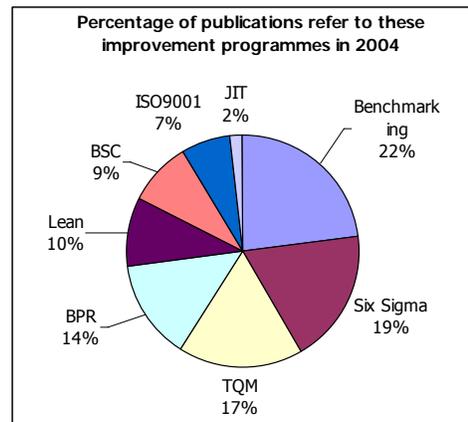


**Figure 4.2: Frequency of hits and trends for Technique and Approaches from ProQuest (1990-2004)**

Clearly, from both Figure 4.1 and Figure 4.2, the two main fashions as regards QM and CI during this period were TQM and BPR, peaking in 1993 and 1995 respectively. Initially, much of the QM and CI discourse was centred around TQM, which theme was further promoted through association with the new quality awards such as MBNQA (Sun *et al.* 2004; Conti *et al.* 2003). However, many critics of the TQM movement arose (McCabe & Wilkinson 1998), which tarnished its image and may have led to diminished interest. Possible reasons for the strong peak in popularity for BPR could be

that: (1) major US companies achieved breakthrough change within a short time period using BPR and these successes were widely reported and (2) the technique was effectively-promoted and was an American invention, not another idea imported from Japan (Boje *et al.* 1997). Nevertheless, a comparative study of Western and Japanese improvement systems in the early 21st century conducted by Magaña-Campos and Aspinwall (2003) and a later survey by Bain & Company (Rigby & Bilodeau 2005a) show that all regions valued TQM above BPR.

In recent years the numbers of articles related to, Lean, Balanced Scorecard (BSC) and particularly Six Sigma have been growing rapidly, although not to the peak levels of major fashions such as TQM or BPR. There are indications, therefore, of a shift in academic and business interest from the TQM, BPR and ISO9000 towards these themes. In 2004 the number of publications related to Lean, BSC, and Six Sigma appeared still to be increasing. To examine the recent position and considering only the numbers of articles published in 2004, Benchmarking held the top position with 358, Six-Sigma took second place with 290, while TQM came third with 267 following by BPR, Lean, Balanced Scorecard, ISO and JIT with 214, 154, 139, 108 and 24 hits respectively. Figure 4.3 shows the proportion of publications referring to these techniques in 2004. The relatively low number of recent articles focusing on quality awards such as EFQM and MBNQA was a surprise to the author, as these are considered to be important current approaches by many in business.



**Figure 4.3: Publications on approaches in 2004**

A decline in the number of academic articles related to a particular approach could have various origins, including: (1) the concept is mature, there is relatively little potential new knowledge contribution, and/or (2) outcomes from the approach are disappointing and do not match early expectations, and/or (3) more effective (or at least newer) approaches have emerged. As a result of any or all of the above, authors and editors will tend to lose interest and the number of publication will decline. Thus, Six Sigma, by providing a well-structured, technique-oriented methodology and by promising cost

savings, has presented a substitute for the mature and perhaps somewhat tired TQM theme. The number of publications may be sustained, if researchers are still discoursing and contributing to the body of knowledge in the theme. Indeed, some articles emerge which reflect upon the decline of major fashions, thereby increasing citation hits in their declining years. Moreover, the decline phase in publications on a management fashion could be upheld by a new loop of invention and innovation of a new management idea, which is blended with the previous one and holds or advances the interests of the previous fashion.

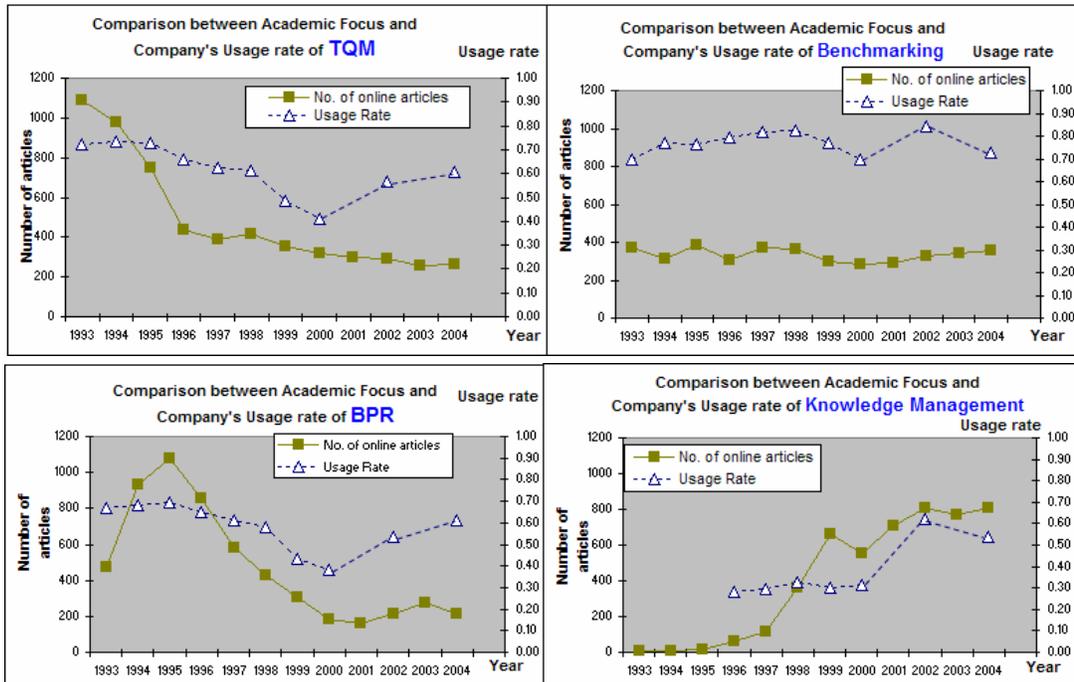
#### ***4.1.4 Comparisons between publication rates and industrial practice***

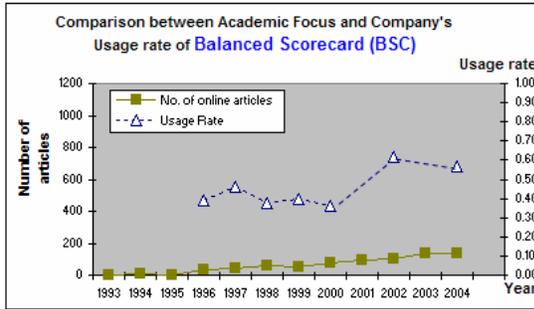
The above sections have provided an overview of trends of publication in QM, CI and some comparable areas. Such PMI data relate primarily to the fashion setting or supply side, and reflect interest from academics, consultants and practitioners. This section provides comparisons between these publication trends and the actual usage of management approaches in companies, surveyed by consultants Bain & Company. Bain & Company have conducted a series of ten surveys on 'Management Tools & Trends' since 1993 (no data is available for 2001 and 2003) which has covered over 70 countries in North America, Europe, Asia, Africa, the Middle East and Latin America. The 2005 survey included responses from 960 executives and its results are presented in detail by Rigby & Bilodeau (2005a) and summarised by Rigby & Bilodeau (2005b). The survey investigated usage of and satisfaction with, 25 management tools of interest to senior management. The author selected seven of these tools: TQM, BPR, Six Sigma, Benchmarking, KM, Change Management and BSC for comparison. Table 4.1 compares PMI data (from ProQuest) and company usage rates for these initiatives. Using the data from Table 4.1, the combined graphs in Figure 4.4 illustrate on the same time scale the trends of company usage rate and publication trends for five of these initiatives. The graphs can assist with three comparative analyses: 1) correlation and relationship between academic discourse and company usage, 2) trends of popularity, and 3) the effectiveness of academic publication upon company adoption rate.

**Table 4.1: Comparisons between the popularity of QM and CI initiatives between Academic publications and company utilisation**

Popularity of QM and CI initiatives *	Rank	1993	1994	1995	1996	1997	1998	1999	2000	2002	2004	Jan-Aug 2005	
Academic (Number of online Journal articles from ProQuest)	1	TQM (1086)	TQM (976)	BPR (1074)	BPR (854)	BPR (583)	BPR (430)	KM (659)	KM (553)	KM (809)	KM (804)	KM (491)	
	2	BPR (474)	BPR (930)	TQM (948)	TQM (440)	TQM (386)	TQM (416)	TQM (351)	TQM (319)	Benchmark (328)	Benchmark (358)	Benchmark (218)	
	3	Benchmark (370)	Benchmark (315)	Benchmark (382)	Benchmark (305)	Benchmark (370)	KM (365)	BPR (302)	Benchmark (282)	TQM (294)	Six Sigma (290)	Six Sigma and BPR (155)	
	4	Change mgt (124)	Change mgt (155)	Change mgt (181)	Change mgt (120)	Change mgt (141)	Benchmark (360)	Benchmark (297)	BPR (181)	Change mgt (229)	TQM (267)	Change mgt (148)	
	5	KM (5)	KM (6)	KM (12)	KM (59)	KM (116)	Change mgt (160)	Change mgt (137)	Change mgt (147)	BPR (211)	Change mgt (266)	TQM (117)	
Company's Usage rate (Percentage of the company usage from the survey by Bain & Company)	Top Ten	TQM (72%) Benchmark (70%) BPR (67%)	Benchmark (77%) TQM (74%) BPR (68%)	Benchmark (76%) TQM (73%) BPR (69%)	Benchmark (79%) TQM (66%) BPR (65%)	Benchmark (82%) TQM (62%) BPR (61%)	Benchmark (82%) TQM (61%)	Benchmark (82%) TQM (61%)	Benchmark (77%) TQM (49%) BPR (38%)	Benchmark (69%) TQM (41%) BPR (38%)	Benchmark (84%) Change mgt (64%) KM (62%) BSC (62%)	Benchmark (73%) Change mgt (59%) BSC (57%) KM (54%)	
					BSC (39%) KM (28%)	BSC (46%) KM (30%)	BPR (58%) BSC (38%) KM (33%)	TQM (49%) BPR (44%)	TQM (41%) BPR (38%) BSC (36%) KM (32%)	Change mgt (64%) KM (62%) BSC (62%) TQM (57%) BPR (54%)	Change mgt (59%) BSC (57%) KM (54%) Six Sigma (34%)		

\* Initiatives Comparing among TQM, BPR, Benchmarking, KM, Change Management, Six Sigma, BSC





**Figure 4.4: Comparisons between academic trends and company utilisation**

The comparative graphs in Figure 4.4 suggest that trends of QM and CI initiatives from the PMI data and the extent of company usage tend to be related. The two most important earlier fashions (TQM and BPR) resemble each other in terms of both overall publication volume and company usage rate. During the years for which comparative data were available, these fashions showed a strong positive relationship between the number of articles and usage rate, having Pearson's  $r$  correlation values of 0.746 ( $p < 0.05$ ) and 0.735 ( $p < 0.05$ ) respectively, suggesting that the trends in publication and company adoption for both TQM and BPR had strong relationships. Appendix 15 displays all data for trends analysis composed of the number of academic publication extracted on the 5<sup>th</sup> August 2005, company usage rate and satisfaction from Bain & Company (2005a), and their correlation graphs with values. Such simple quantitative analysis, however, does not fully address the important issues of trend and relation between the PMI and company usage data. The discussion below, therefore, considers also the overall levels and trends seen on the comparative graphs.

TQM peaked in 1993 with 1084 publications and had a maximum usage rate of 74 percent in the same year. Two years later, BPR peaked with 1074 publications and a 69 percent usage rate. It is interesting to note that BPR company usage was running at a high level (approximately 60 percent) for two years before the publication peak, suggesting that business usage was leading this fashion. For both TQM and BPR, the peak usage and publication rates coincided and were followed by a rapid decline in publication rate, but a slower and delayed decline in usage. Since 2000, both approaches have shown a resurgence in company usage, with no corresponding increase in publication.

Among the techniques, also, publication rate does not always reflect the company usage rate. Benchmarking-related publications were highest in 1995, at a much lower level (382) than the two major fashions, but have since continued at similar annual rates. However, this technique has consistently held the leading place in terms of business usage, with between 69 percent and 84 percent adoption. By contrast, BSC has showed moderate but generally increasing take up in business since 1996, but has received relatively little attention in the academic and management discourse. The final graph shows the position for KM, which shows increasing publication rates since 1996, having been the leading fashion since 1999. Adoption rates increased noticeably in 2000, suggesting a three year lag in adoption and a peak business usage of around 60 percent. The evidence to date does not suggest that either publication or adoption rates will increase further and this fashion may have peaked. The diversity of these results shows that higher publication rates are not linked to business adoption in any simple or mechanistic manner. This leads to questions about the effectiveness of academic publication in fashion dissemination and also about the differences between these various fashions.

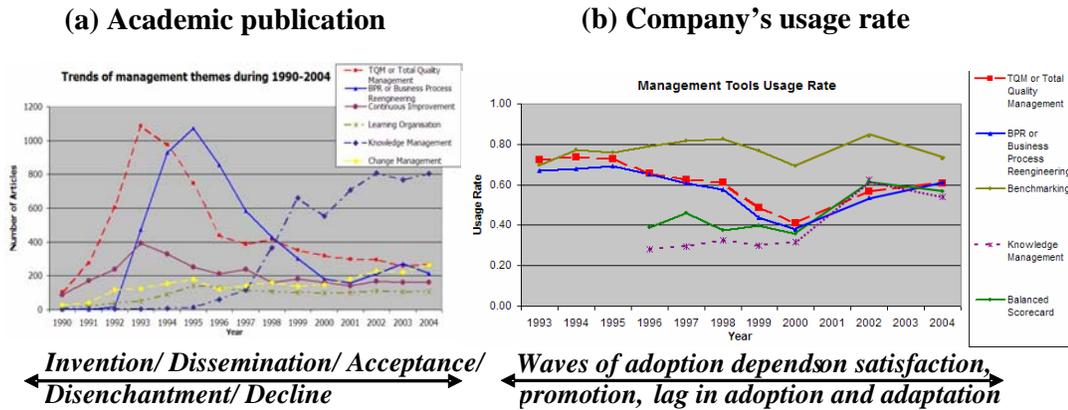
If an approach fails to provide good results, it might be expected that it will tend to fade away, in both academic discourse and business usage. However, as noted above, the latest Bain and Company survey (Rigby & Bilodeau 2005b) reveals that TQM and BPR, which had appeared to be declining fashions, were both apparently making a usage comeback in 2002, with yet higher rankings in 2004. A return to popularity for these approaches, in terms of company adoption, could shed a new light on previous explanations of management fashion life cycles, which have referred to PMI traces as following a 'bell-shaped curve' (Gill & Whittle 1993; Abrahamson 1996; Benders & van Veen 2001; Clark 2004) in which the life cycle is influenced by phases of 1) Invention, 2) Dissemination, 3) Acceptance, 4) Disenchantment and 5) Decline.

#### ***4.1.5 The international dimension – adoption or adaptation?***

'TQM, ISO9000, Six Sigma, Lean or EFQM, all these programmes were born in Japan or the West, grow in the United States and die in Thailand.'

Master Black Belt at Essilor Company

The results above and Figure 4.5 suggest that life cycles of fashions on the consumer side may be different from those on the fashion setter side.



**Figure 4.5: Patterns of life cycle in academic publication and company's usage rate**

An apparent usage comeback staged by an older approach (without evidence of higher levels of publication) might result from time delay effects in global dissemination, or from the changing degree of readiness, in the developing world, to adopt them. Once QM and CI initiatives have become popular in developed countries, they tend to travel across the globe and be adopted in developing and newly industrialised countries. For example, Ab Rahman & Tannock (2005) describe the comparatively recent adoption of TQM by smaller companies in Malaysia, as they reach a level of sophistication which allows them to address this approach. The usage survey conducted by Bain & Company also examined this issue. Again the trends in TQM usage are instructive: from 1993 to 1998, TQM was among the top global approaches; subsequently its usage in the US and Europe declined. Only companies in Asia still prefer TQM, which ranked here as the second most popular approach (Rigby & Bilodeau 2005a).

Managers in developing and newly-industrialised countries often seek to adopt management fashions originating in the developed world. Multi-national companies are leading agents in the transfer of QM and CI approaches and techniques, but other dissemination routes include joint ventures, supply chain partners, consultants and the media. Kano (2004) suggested that QM and CI approaches can change in emphasis and content, according to the industrial culture in which they are adopted. Approaches and techniques can be adapted with new ideas, which go beyond its originators' perspective and can then, perhaps, return to the country of origin and be re-assimilated. For

example, earlier Japanese ideas of TQC morphed into a US version renamed TQM, while the original US military standards evolved into the Europe-led ISO 9000 series and were subsequently re-imported into the USA. At present, Six-Sigma is becoming increasingly fashionable in China but there is anecdotal evidence of change and simplification of the concept.

Another example of the global adaptation process in the field of QM is the position of national quality and excellence awards. Many of these awards were originally based on the US Malcolm Baldrige National Quality Award (MBNQA), but focus and criteria were frequently changed to accord with language and local business requirements (for example the Thai, Malaysian and Singaporean awards). Meanwhile, the MBNQA principles and criteria have evolved and new criteria for particular application areas (education and health care) have appeared. The early focus was primarily on quality, operational results and customer satisfaction. The more recent European Foundation for Quality Management (EFQM) Excellence model identified the importance of stakeholders and included employee satisfaction and social responsibility. Perhaps influenced by such competition, later MBNQA versions incorporated similar concepts (Conti *et al.* 2003). The MBNQA model continues to evolve on a regular basis, unlike many of awards derived from it by other nations. Figure 4.6 shows the dissemination and the adapted versions of QM initiatives.

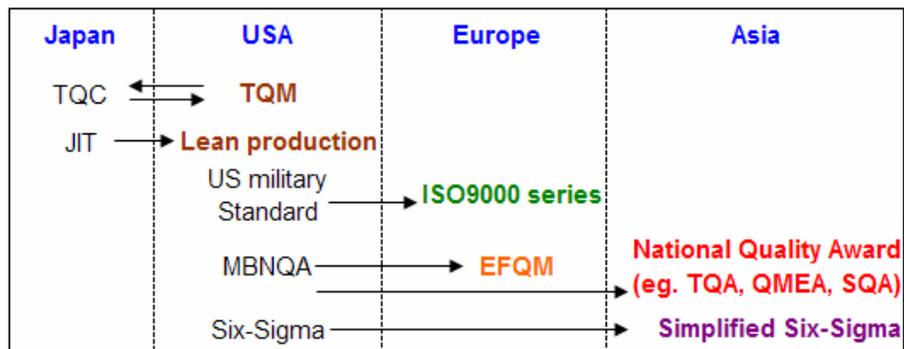


Figure 4.6: Dissemination and adapted version of QM initiatives

#### 4.1.6 Dissemination of management fashions through internet search

Worldwide dissemination of these management fashions is of interest to the author. According to the British Quality Foundation survey (Charlesworth 2000), information from internet searches had influence in the selection of these quality initiatives. A

further investigation of these management ideas circulated in written messages through the World Wide Web was carried out. Internet search engines such as yahoo, msn, and Google allow people to readily access and search for specific knowledge about key terms. When keywords associated with management ideas, techniques or acronyms are typed into these search engines, they provide links to relevant webpages. Detailed information such as definition, concept, and benefits from adoption could then be easily acquired to develop knowledge and support the decision-making process.

By utilising ‘Google trends’, a recent Google labs product, the author was able to identify worldwide trends about specific management techniques and compare up to five management techniques. The search terms selected for comparison, whose trends are displayed in Figure 4.7, were Six Sigma, TQM, ISO9001, BPR, and Lean manufacturing respectively. Nevertheless, a Google trend does not provide actual numbers and it is not recommended by Google for use by researchers. Hence, it is used here as supporting evidence only. The input keywords here were (Six Sigma), TQM| (Total Quality Management), ISO9000| ISO9001, BPR| (Business Process Reengineering), (Lean manufacturing)| (Lean production). Figure 4.7 illustrates their trends during 2004 to 2006, which were extracted on the 28<sup>th</sup> August 2006.

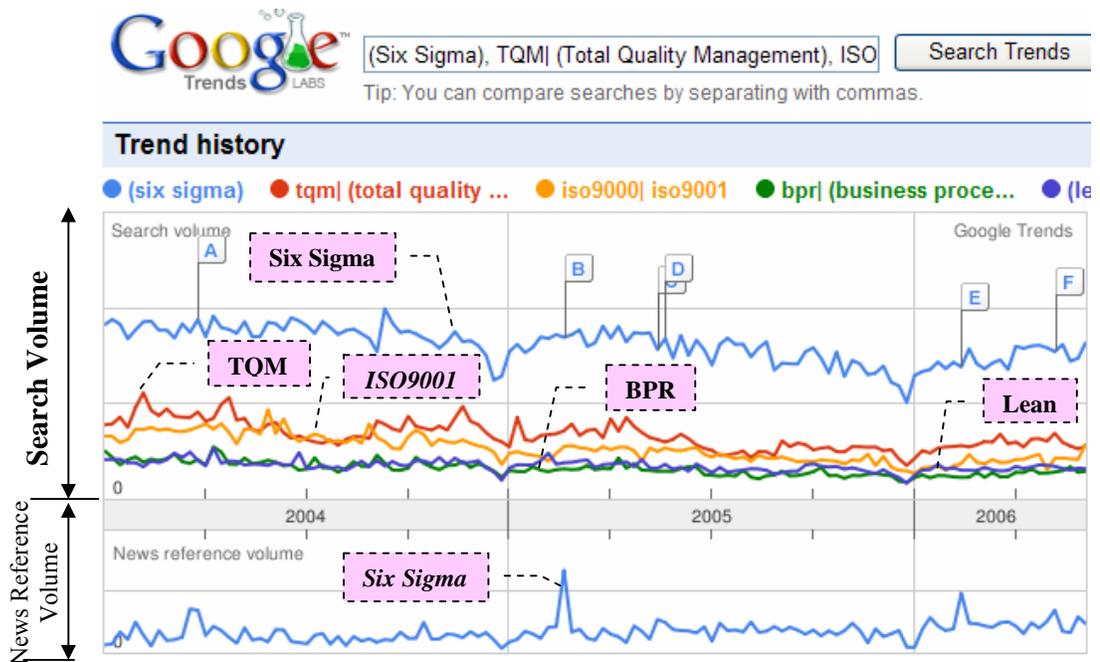


Figure 4.7: Trends in the online search volume of five QM techniques

The graph of trends during 2004-2006 showed that Six Sigma was the clear leader among these initiatives. While Six Sigma was the most popular search keyword, TQM was next with half of its search volume, followed by ISO9001. BPR and Lean manufacturing searches were both approximately a quarter of the Six Sigma inquiries. Graphs for Six Sigma, TQM, and ISO9001 have been gradually and fairly consistently declining since 2004. Over the two and a half year period, graphs from all these terms did not show any great fluctuation in search frequency. They do not display the 'bell-shaped' patterns sometimes shown by trends in the number of academic publications (Figure 4.2). Their levels were relatively steady especially for BPR and Lean terms. It may be attributable to the process of fashion transfer from one country to another. In that case, the graphs could have been sustained partly by people in one country who still believed in and used that initiative, and partly by people in regions where the initiative had just arrived, caught people's interest, and was becoming the new fashion. TQM, for instance, had remained its search volume in 2006 partially by people who are new to this idea i.e. Vietnam, United Arab Emirates, and Egypt and by people who are still favour in the idea i.e. Thailand.

The large amount of search volume for Six Sigma is also in response to the higher number of academic publications on the topic of Six Sigma and its ascending rates of adoption since 2004, as described in the previous paragraphs and shown in Table 4.1. All of these pieces of evidence indicates and confirms that Six Sigma is a current global fashion. TQM, on the contrary, showed its lesser popularity in the Google search volume as well as academic discourse, but still continued its higher rate of adoption. This may result from the time delay in disseminating and accepting or rejecting the ideas and the country or the cultural differences according to the frequency with which searches for 'Six Sigma'.

The bar chart in Figure 4.8 ranks the top ten regions, which frequently searched for 'Six Sigma' and 'TQM.' It demonstrates regions where messages about these improvement initiatives were travelled to, been transferred and became popular. Countries in Asia or the newly-industrialised countries, i.e. India, Singapore, Indonesia, Malaysia, Hong Kong and Thailand, were the focus and revealed their high interests in Six Sigma, followed by the United States, Mexico, Australia, and the United Kingdom. This also reflects the movement of manufacturing base to low-cost countries with a higher interest

in and adoption of improvement techniques. The reason is that most of these initiatives were established from and aimed for manufacturing industry, although their scopes have been expanded to cover the service and public sectors.

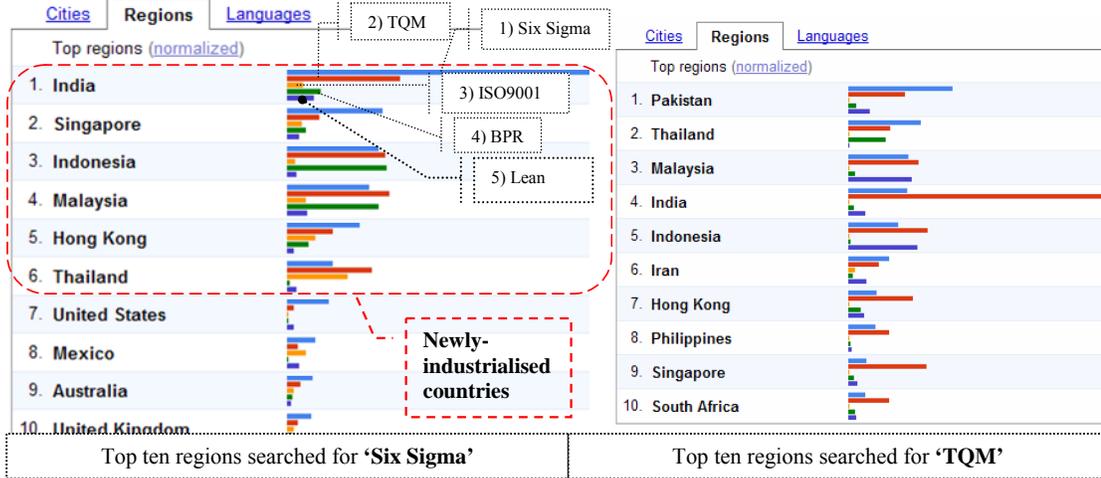


Figure 4.8: Bar chart of the top ten regions searched for 'Six Sigma' and 'TQM'

Among these five initiatives, TQM had sustained its second rank mainly because of the people from Pakistan, India, and the Southeast Asian countries - Indonesia, Malaysia, Thailand, and the Philippines, who had high interests in TQM. This may be due to the possibility that TQM is more compatible to the Asian culture and it is still popular in those countries. While TQM and ISO9001 were still frequently searched for in Asia and other low-cost manufacturing countries such as South Africa, and Columbia, they have lost their attractions in the United States and are less popular in the United Kingdom and Japan, where they originated. It may be because there was not much new knowledge created in TQM and ISO9001. Six Sigma, on the contrary, was an initiative from America as well as being a fashionable technique associated with similar themes of quality and process improvement. This evidence also suggests that fashion setters in developed countries developed the ideas (originators) and that they were well received in the newly-industrialised countries (acting as adopters). An Interview with a Master Black Belt in a multi-national company revealed that top management from the corporation must perceive real benefits before they decide to deploy new change programmes and Asia plants always started first as an example and showed its impact - success or failure. Instead of being a 'guinea pig', which applied whatever is new (fashion consumers) without having a rational consideration, should these newly-

industrialised countries be more aware of these prevailing three acronyms i.e. TQM, BPR, ISO, Lean and Six Sigma?

#### ***4.1.7 Conclusion of 'fashion setting'***

Are approaches such as TQM, BPR, ISO9000, Six Sigma, Lean production, and Business Excellence model fads and fashion? Exploring management fashions is a valuable way to comprehend this complex area and to manage new and emerging management initiatives. Previous research works have focused mainly upon the fashion-setter side, with relatively limited interest in fashion consumers or adopters. This section has attempted to contribute to both sides of the picture, to develop a richer picture of the fashion phenomenon in QM and CI; areas that have been central to the general management rhetoric of recent decades. The selected QM and CI-related themes demonstrated a range of patterns as regards publication rates, as shown by the ProQuest PMI data of citation hits. TQM and BPR, as examples of major fashions, showed a classic 'bell-shaped curve', with sharp rises and falls in citation hits; in contrast to 'lesser' themes and techniques which did not peak so obviously or so strongly. There was a clear distinction in PMI terms, between important themes (such as TQM, BPR and KM) and techniques with a relatively limited scope such as Benchmarking, about which there was a much lower level of publication.

Company usage, for each approach studied, typically showed similarities in general trend when compared with publication rates. The author found the comparison of usage levels between approaches to be more problematic. Benchmarking, for example, despite having a much lower publication rate than the major themes, has been consistently the most popular approach in terms of company usage. The comparison between BPR and Benchmarking is instructive, suggesting that linkages between overall levels of company usage and publication rates will be complex and mediated by issues such as the nature, scope and reputation of the approach.

A quantitative comparison of publication trends with this usage data shows that publication and usage trends appear to resemble each other. There are inevitable delays in both company adoption and academic publication, but the evidence for the existence of time-lag effects in either direction, between usage and publication rates is not clear.

This is partly due to the lack of survey data on company usage before 1993, which means that it was not possible to study the increasing trend in usage for TQM and BPR. There were, however, clear indications for KM of a three year gap, between a publication rate and usage increases. The declines in publication related to TQM and BPR were followed by declines in usage, with a delay of approximately three to five years. In general, company usage levels, especially for the two major fashions, seemed less volatile than academic publication and were sustained (or even increased) after publication rates dropped away. Hence, a ‘bell-shaped curve’ life cycle pattern was not observed in the company adoption data for any of the themes studied.

Based on these investigations of management fashion in QM initiatives, three indicators which explain the fashion setting phenomenon are:

- 1) Volume of academic publications, which represents the focus of fashion setters.
- 2) Company usage rate, which provides the popular response from fashion consumers.
- 3) Volume of search terms in the Google search engine, which expresses the level of the world’s interest and identifies which regions, searched for them the most.

Management fashion at these three stages explained how the ideas or initiatives were created, disseminated, and adopted. The author suggests that global time-effects in fashion dissemination could tend to mask such distinct patterns in the usage data. In particular, company usage patterns may be confused by adoption delays in developing and newly-industrialised nations, resulting from issues such as company development levels, language and other cultural compatibility issues. These are research issues of some interest and the author intends to continue our work in this area, aiming to investigate these effects and develop more general theories of management fashion dissemination. The following section moves from this less rational decision based on trends and fashion, to explore a deeper rational consideration of benefits that can result from the adoption of these improvement initiatives or so-called *pay-offs*.

## 4.2 PAY-OFF AS SELECTION CRITERIA

The variety of possible Quality Management (QM) and Continuous Improvement (CI) initiatives and their various possible permutations can make it difficult for a company to choose the best approach for their requirements. The author considered that a more detailed study of the literature; while retaining a quantitative approach would bring further advance in understanding. This section addresses the pay-offs as one selection issue and presents a method to compare popular CI approaches from the perspective of the pay-offs. It then summarises the relevant QM and CI literature, outlining six key initiatives and their expected pay-offs to the organisation. A matrix diagram approach is introduced which presents the extent and credibility of arguments advanced for these initiatives, in seven categories of pay-off. A system of assessment is proposed, which quantifies the extent and weight of empirical evidence and estimates the strength of the claim for each pay-off. The Pay-Off Matrix summarises the claims in each of the pay-off categories, assesses their credibility, and displays the similarities and differences for six key initiatives: Total Quality Management, Six Sigma, ISO9000, Business Process Reengineering, Lean and Business Excellence. Graphical pay-off profiles are presented. Significant differences between the claimed pay-offs for these initiatives are identified, analysed and discussed. The proposed matrix and assessment system attempts to support a comprehensive and rational approach to assess the pay-offs of QM and CI initiatives.

### 4.2.1 Introduction

Throughout the evolution of Quality Management (QM), both new and evolutionary themes in Continuous Improvement (CI) have emerged and been adopted internationally, sometimes evolving substantially in the process. During Japan's 'quality revolution' from the 1950s until the 1970s, there were relatively few choices, such as Quality Control Circles (QCC), Total Quality Control (TQC), and Just-in-Time (JIT). Today, by contrast, there are a plethora of old and new approaches and techniques from which to choose. Total Quality Management (TQM), ISO9000 series standards, Six-Sigma, Lean, Business Process Re-engineering (BPR) and Business Excellence models are among the popular initiatives which, it is claimed, support an organisation's improvement efforts. Pay-off or expected outcome, especially in financial aspects, from the application of any initiative is important to influence top management decisions

(George 2003). After the six sigma programme appealed to many managers by linking its activity to transparent and numerical financial benefits, the British Standard then launched a new quality management guideline for realising financial and economic benefits from the application of the ISO9000 quality management principles, BS ISO10014:2006 (BSI 2006). These enhance the existence of pay-off as a selection criterion.

The variety of QM and CI approaches, with the many suggested permutations and blending recipes, potentially make it difficult for the company to choose the most suitable approach. Although clear trends in academic publication rates for QM and CI initiatives may be seen in the academic literature and frequently-adopted QM and CI approaches can be identified (Rigby & Bilodeau 2005a; Charlesworth 2000) as described in the aforementioned section 4.1, there is little research providing assistance and guidance on how to select and link these strategic improvement approaches. Most literature on QM and CI has been focused on describing the concept, methodology and tools of each approach, often also providing empirical evidence on strengths, weaknesses and critical success factors. Useful and comprehensive reviews of the literature related to specific initiatives are also available (e.g. Hendry & Nonthalerak 2005). However, there is little comparative analysis available to provide decision support. This section describes an approach to addressing the selection issue, by presenting a method to compare popular quality and improvement approaches from the perspective of the pay-offs, or expected benefits, to a company which successfully adopts the initiative.

The author first summarises the relevant QM and CI literature, outlining six key initiatives and their expected pay-offs to the organisation. Pay-offs for successful adopter companies have been claimed and demonstrated by many researchers, and provide an influential selling message for management fashion suppliers (Abrahamson 1996), such as consultants. The expected pay-off is one of the key decision criteria, when management wishes to make a rational choice between new initiatives. A key issue is the credibility of the evidence, especially that supporting claims made by those with an interest in promoting a particular approach. For this purpose, the academic and business literature was analysed to establish the claimed pay-offs. Suggested benefits and effects of the initiatives to the company are grouped into seven categories. A Pay-

Off Matrix diagram was developed which summarises and illustrates the strength and credibility of the evidence found in the literature, for each potential category. A system of assessment is proposed, which identifies the extent and weight of empirical evidence, and the credibility of the claim for each pay-off. Similarities and differences between expected pay-offs for different initiatives are identified and illustrated. The author concludes by suggesting ways in which evidence of this type might be most effectively used by managers for decision support in the choice of quality and improvement initiatives.

#### ***4.2.2 Selecting and organising the pay-off evidence***

Pay-off information in this paper was summarised from academic publications, which are readily accessible. The author considers that they are generally more reliable than other sources, such as the media and consultants' promotional materials. Print Media Indicators (PMI) have been widely used (Abrahamson 1996) to establish the importance and life-cycle of management fashions, but this method counts only quantity: the numbers of citations, from online searches of publication databases. The evidence-based methodology and a systematic process to review available testimony provide insights and guidance, and hence enhance the knowledge base for policymakers (Tranfield *et al.* 2003). The author chose to combine the PMI approach with an evaluation of the strength and quality of the evidence from the literature, aiming to show the suggested benefits, advantages and effectiveness of each initiative based on published literature up to the year 2005. Pay-offs for the six chosen initiatives were investigated using secondary PMI evidence, utilising the online e-library database ProQuest Direct (PQD) and also an online search engine (Google), to search for papers. This process produced a long list of several hundred papers.

The author reviewed all the paper abstracts and selected those for which pay-offs, benefits or outcomes were indicated. The author then studied the selected papers in detail and carried out a content analysis against pre-selected key words representing pay-offs. The six components of content analysis according to Krippendorff (2004) are unitising, sampling, recording/coding, reducing data, abductively inferring, and narrating. The claimed pay-offs from the selected papers were captured, recorded, and coded in the database template in order to reduce the large volume of data to a more

manageable representation. The author is well aware that it might be possible to point to evidence which does not appear here, since the search terms used may not select all evidence sources or claimed pay-off made for each initiative. In addition, some abstracts may not have made clear that a claim for pay-offs or benefits was included in the paper. Nevertheless, the author has used search engines in an objective and intensive way to uncover evidence and attempt to determine the strength of each claim. Each selected publication was categorised into one of four types (see Table 4.2).

**Table 4.2: Categories of evidence**

Type	Description	Abbreviation
1	Paper in a journal listed in the Journal Quality List, 7 <sup>th</sup> edition, 4 December 2005, assessed, compiled, and edited by Dr. Anne-Wil Harzing.	J
2	Paper in journal not included in the Journal Quality List	JvO
3	Other published papers or reports including conference papers, working papers, white papers and research reports from influential organisations such as government bodies or international consultancies.	P
4	Books	B

A total of 98 items of evidence were found, from 62 different sources including 24 journals contained in Harzing’s 2005 Journal Quality List and 17 outside, 10 books and 11 other influential published papers. The research methods supporting the claimed pay-off were divided into two: Descriptions (with or without examples of successful case studies), and Empirical studies (case studies, survey, exploratory, longitudinal). High ranking journals were specifically identified. Figure 4.9 shows an excerpt from the evidence data tables, illustrating items of evidence relating to the stock price pay-off. Appendix 16 displays the detailed database.

Pay-Off		Improvement Approach					Authors	Year	Book/Journal/ Publication	Research Method	Suggestions Description	Category of paper		
Category	Sub-category	T	I	L	S	B						E		
Shareholders	Increase stockmarket price	1					1	NIST	2004	The tenth NIST Stock Investment Study	Empirical	Baldrige stock studies showed that the baldrige winning companies had outperformed the benchmark of S&P500 for consecutive nine years since 1993; however, in the last two years it has underperformed.	P	
								George	2002	Quality Progress	Empirical	The Q-100 index of companies that use TQM assembled by Robinson Capital Management is used to compare the stock price with S&P500. The Q-100 outperformed the S&P500 from sep 1998 to dec 2001 determined by the growth in dollars investment. Investors believe that quality improvement efforts positively impact stock performance.	JvO	
								Hendrick & Singhal	2001	Management Science	Empirical	The 608 quality award winners show significantly improve in their stock price performance during the TQM postimplementation period.	J	High
								Easton & Jarrell	1998	Journal of Business	Empirical	109 US Firms who implemented TQM during 1981-1991 improved their financial performance and stock returns. Improvement showed stronger in more advanced TQM firms.	J	High
								Hendrick & Singhal	1997	Management Science	Empirical	Empirical evidence from Baldrige winner firms. Under the definition that a Quality Award is criterion for a successful implementation of TQM, TQM helps improve stock market price, financial performance, quality and operating performance. The improvements show during the postimplementation period. (5 yrs preimplementation and 5 yrs postimplementation)	J	High

**Figure 4.9: Example of the database**

In general, the author will not reference the literature sources that the author analysed, or present a review of the literature in conventional terms, but refer only to a few key

sources to illustrate the approach taken for one key pay-off. The body of evidence was partially validated for completeness and coverage of recognised and influential sources in the field, using a recent review paper from the American Society for Quality (Ryan 2005). However, that paper describes positive impacts of QM practice, focusing on company performance and financial figures and provides little information on other types of pay-off associated with each initiative. Financial pay-off is not the only motivating factor, when a company chooses to adopt QM and CI initiatives, but several of the most influential sources of evidence which the author examined, focused primarily on financial issues. An early, influential study presenting solid evidence of positive impacts of quality on business results was the Profit Impact of Market Strategy (PIMS) research by Buzzell & Gale (1987). This study encouraged academics and managers to pay close attention to the quality issue. A number of subsequent studies have examined the linkages between QM practices and company performance. The US General Accounting Office (US GAO 1994) found US companies that used TQM principles obtained pay-offs in higher productivity, greater customer satisfaction, increased market share and improved profitability, as well as employee relations (determined by increased job satisfaction, improved attendance, and decreased employee turnover). Important contributions by Easton & Jarrell (1998) and Hendrick & Singhal (1997, 2001) then provided empirical evidence of positive stock market valuations related to TQM adoption. All of these and other sources are used as evidence in the tables and diagrams below.

Claimed pay-offs of quality and improvement initiatives extend beyond the financial area and potential rewards of implementation have grown in scope, as a result of the enlargement of the CI concept, which has become broader and more holistic, aiming for business as well as operational improvement. Suggested benefits or expected outcomes of the six initiatives are excerpted, summarised, and grouped into seven categories: shareholder benefits, company performance, marketing performance, customer satisfaction, human resources, process improvement and organisational benefits. These were further sub-divided, into a total of 29 sub-categories as listed in Table 4.5. A description and short summary of all the selected papers were classified under the 7 categories and stored in an Excel spreadsheet formatted as a database, as illustrated in Figure 4.9.

### 4.2.3 The pay-off matrix

With the large numbers of sources making claims about the effectiveness of QM initiatives, the author proposes an assessment system to evaluate the credibility of the various claims. Following typical practice in the field of quality management, a matrix diagram technique was used to summarise the key suggested pay-offs and depict the extent and credibility of evidence found in the literature. Similarities and differences among the six initiatives are also displayed using the diagram. Three assessment criteria: Strength of the paper (S), Empirical evidence (E), and Substantial Agreement (C) were used to assess the strength of each publication, which supports each particular aspect or sub-category of the claimed benefit. An assessment score from 0 to 3 was used to rate the claimed evidence under the 29 sub-categories (for a listing of all the sub-categories, see Table 4.5). Any initiative, for which no reviewed paper showed evidence related to pay-off, will show a '-' sign indicating 'not available'. The total score for each sub-category was the summation of S, E and C score, with the minimum value of 0 and maximum of 9. A total score 1 - 3 was considered as low, 4 - 6 as medium and 7 - 9 as high credibility. Table 4.3 shows the assessment criteria, abbreviations, description and assessment scores. Average scores for sub-categories of each main category are provided in Table 4.4 and the detailed scores of all sub-categories are shown in Appendix 17.

**Table 4.3: Assessment criteria and assessment score**

No	Assessment Criteria	Abbreviation	Description	Assessment Score
1	Strength of the paper	S	Influential paper or strong publication	Low: 1 = some evidence and presence Medium: 2 = considerable evidence and presence High: 3 = strong and overwhelming None: 0 = No evidence N/A: '-' = Not Available
2	Empirical evidence	E	Claim made supported by empirical evidence or not	
3	Substantial agreement	C	Consensus and substantial agreement/ numbers of paper support the same claim.	
Total = S + E + C		T	Total strength of the claim	Min = 0, Max = 9

As is shown in Table 4.4, using as an example shareholder benefit, due to the increase in stockmarket price, both TQM and BE received scores of 3 (high credibility) in each of S, E and C, because these claims were all supported by three strong journal papers, published in journals ranked highly in Harzing's 2005 Journal Quality List. Five publications supported this benefit with empirical evidence. For the same pay-off (stockmarket price), only one piece of empirical evidence was found for the ISO 9000 initiative, albeit in a paper published in a strong journal; therefore, S,E and C scores

were 2,1,1 respectively. Evidence concerning the Six-Sigma initiative showed a neutral effect on stockmarket price with empirical support from a paper published in a weaker journal.

Once S, E, and C scores were assigned, the total T score which indicates the overall strength of the claim was calculated. T scores for shareholder benefits of TQM, BE, ISO, and Six Sigma were 9,9,4,3 respectively, which suggests a high credibility for this claim for TQM and BE, medium for ISO and low for Six Sigma (Table 4.4). Highlights in the matrix show the maximum score compared among other categories in the same initiative. Were a company to adopt all these initiatives, the average and total score of the overall claim strengths in terms of positive shareholder benefits would be 7.3 and 22 respectively, as shown in the columns on the right of the matrix.

**Table 4.4: Matrix diagram for assessing pay-off claims**

No.	Pay-offs	Direction	Initiatives																								Average	Total				
			TQM				ISO				Lean				Six Sigma				BPR				BE									
			S	E	C	T	S	E	C	T	S	E	C	T	S	E	C	T	S	E	C	T	S	E	C	T						
1	Shareholder benefits	Positive	3	3	3	9	2	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	9	7.3	22
		Neutral	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	3	-	-	-	-	-	-	-	-	-	-	-	-	3.0	3
2	Company performance	Positive	3	3	3	9	3	3	3	9	1	1	2	4	2	2	3	7	3	2	3	8	3	3	3	9	3	3	3	9	7.6	46
		Neutral	-	-	-	-	3	3	3	9	-	-	-	-	-	-	-	-	-	3	1	1	5	-	-	-	-	-	-	-	-	7.0
3	Marketing performance	Positive	-	-	-	-	3	2	3	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5	11
		Neutral	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Customer satisfaction	Positive	3	1	3	7	2	2	3	7	-	-	-	-	1	1	3	5	3	3	3	9	2	1	2	5	6.6	33				
		Neutral	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Human resources	Positive	1	0	2	3	2	1	2	5	1	1	2	3	1	0	1	2	2	1	2	4	1	0	1	2	3.2	19				
		Neutral	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Process improvement	Positive	2	0	3	5	2	2	3	7	1	1	2	3	2	1	3	6	2	2	3	7	1	0	1	2	5.0	30				
		Negative	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	5	-	-	-	-	5.0	5			
7	Organisational impact	Positive	2	1	2	5	2	0	3	5	2	0	2	4	2	1	2	5	2	2	2	6	2	1	2	5	5.0	30				
		Neutral	-	-	-	-	-	-	-	-	-	-	-	-	1	0	2	3	-	-	-	-	-	-	-	-	3.0	3				
Total		Positive	38				45				15				25				34				35				5.7	191				
		Neutral/ Negative	0				9				0				6				10				0				4.5	25				
Total			38				54				15				31				44				35				216					
Average			6				7				4				4				6				5				5.3					

S = Influential paper, E = Empirical Evidence, C = consensus/ substantial agreement, T = Total Score      Maximum = 9

**4.2.4 Data analysis and discussions**

The analysis of the matrix diagram (Table 4.4) comprises of 2 parts: 1) the detailed strength of claims for each initiative, and 2) the overall credibility. Firstly, the detailed strength of each claim was analysed based on the T score. The highest T score for each initiative is highlighted. In this case, the TQM and BE initiatives have high scores for shareholder benefits and company performance; while pay-offs for ISO9000 and Six Sigma emphasise company performance and BPR sources suggest credible pay-off on customer satisfaction. By comparison, papers on Lean technique are fewer, suggest

lesser impact and have lower credibility - hence its total score is much lower than the others. Areas within the matrix for which the T scores are low (or not available) may also signify a lack of research evidence and hence suggest further research directions. From Figure 4.4, it may be seen that there are several areas where the author found that pay-off evidence did not accord with our pre-conceptions. For example, the evidence for the Customer Satisfaction pay-off is as strong for ISO 9000 series as for TQM, and even stronger in terms of Process Improvement.

In some cases, there were contradictory pieces of evidence, as to whether an initiative contributes to positive, neutral or negative results, in a particular category of pay-off. For example, as regards company performance pay-offs from ISO9000, there was credible evidence supporting both a positive and neutral impact. Empirical research investigating firms in Thailand (Thailand Productivity Institute 1999), Australia (Terziovski *et al.* 1997), Brazilian (Lima *et al.* 2000), North America (Wayhan *et al.* 2002), and Greece (Dimara *et al.* 2004) reported a neutral impact of ISO9000 on the company performance; while research in the US (Simmon & White 1999; Corbett *et al.* 2005), Taiwan and Portugal (Yasin *et al.* 2004) found a positive outcome. This pay-off claim may be contingent on the country and the context of the implementing company. Similarly, in the case of BPR, there was considerable evidence suggesting a neutral benefit to company performance, but a greater consensus and weight of empirical evidence supported claims for a positive impact. As anticipated, Six Sigma has high credibility as regards company performance and process improvement pay-off, but lower indications on human resource and shareholder benefits. Despite some debates on the limitations of Six Sigma in terms of organisational impact, the weight of evidence supported a positive organisational impact.

Total and average scores at the right and bottom of the scoring matrix show overall popularity of the claims and their average credibility. The overall scores at the bottom summarise the claims of positive impact and also reports of neutral or negative outcomes. Some negative outcomes were reported for BPR, while neutral outcomes were reported for both ISO 9000 and Six Sigma. Generally, however, the publications reviewed tended to emphasise the positive pay-offs of these initiatives rather than negative or neutral impacts. On the right side, the strongest and most credible pay-offs claims for all six initiatives were found to relate to company performance and customer

satisfaction, with the total and average scores of 46 and 33, 7.6 and 6.6 respectively. At the bottom, the highest total (54) and average credibility score (7) occur under the ISO9000 initiative. This shows that there were a number of papers published on the pay-offs of ISO9000 and on average, they were supported by the greatest degree of credible evidence.

Translating the quantitative scores of the total strength of the claim (T) into a simpler ordinal scale (High, Medium, and Low) helped us to identify the similarities and differences among these six initiatives, as shown in Table 4.5. The rating in Table 4.5 describes the credibility or degree of evidence supporting each claimed pay-off.

**Table 4.5: Similarities and differences among the initiatives**

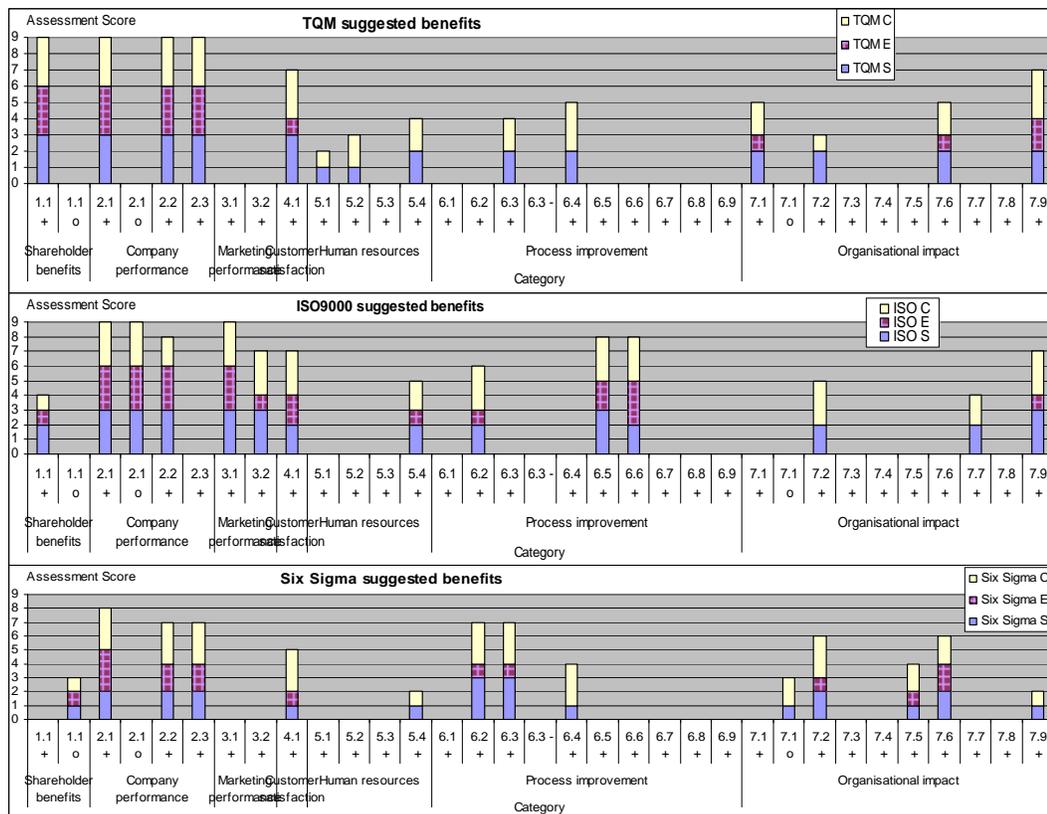
No	Pay-offs Categories	Suggested Benefits (Sub-categories)	Degree of supported evidence/ claim credibility						Category Number
			TQM	ISO9000	Lean	Six Sigma	BPR	Business Excellence	
1	Shareholder benefits	Increase stockmarket price	High	Medium	-	Low	-	High	1.1
2	Company performance	Increase Financial performance (profitability, cost reduction)	High	High (+,0)	Medium	High	Medium (0)	High	2.1
		Quality performance (reduce nonconformity, shorter leadtime)	High	High	Medium	High	-	-	2.2
		Operating performance (increase productivity, improve cycle time)	High	-	Medium	High	Medium	-	2.3
3	Marketing performance	Increase marketing effectiveness	-	High	-	-	-	-	3.1
		Internationally recognised standard for QMS	-	High	-	-	-	Low	3.2
4	Customer satisfaction	Increase customer satisfaction	High	High	-	Medium	High	Medium	4.1
5	Human resources	Reduce number of employees	Low	-	-	-	Medium	-	5.1
		Reduce amount of resource usage	Low	-	Medium	-	-	-	5.2
		Increase dexterity/ flexibility of employee	-	-	-	-	Low	-	5.3
		Provide rewards and recognition	Medium	Medium	Low	Low	-	Low	5.4
6	Process improvement	Process innovation breakthrough	-	-	-	-	High	-	6.1
		Reduce process variation and create process stability	-	Medium	-	High	-	-	6.2
		Provide formalised, systematic and practical improvement methodology	Medium	-	-	High	Medium (-)	-	6.3
		Provide a set of QI tools	Medium	-	Low	Medium	-	-	6.4
		Promote procedural and standardisational work	-	High	Low	-	-	Low	6.5
		Foundation for process documentation and maintainable system	-	High	-	-	-	-	6.6
		Improve workflow, reduce NVA activity and wastes	-	-	Medium	-	High	-	6.7
		Create fast, flexible and accessible information	-	-	-	-	Medium	-	6.8
Enhance inventory management	-	-	Medium	-	-	-	6.9		
7	Organisational impact	Improve competitiveness, effectiveness and flexibility of a whole organisation	Medium	-	Medium	Low (0)	Medium	Medium	7.1
		Build a foundation for CI	Low	Medium	-	Medium	-	Medium	7.2
		Create agile and LO	-	-	Medium	-	-	-	7.3
		Not interrupting operations	-	-	Medium	-	-	-	7.4
		Motivate intensive training	-	-	-	Medium	-	-	7.5
		Improve organisational culture	Medium	-	-	Medium	-	-	7.6
		Articulate business needs for change and improvement	-	Medium	-	-	-	High	7.7
		Accelerate and maintain organisational improvement efforts	-	-	-	-	-	Medium	7.8
motivate quality awareness and increase total participation	High	High	-	Low	-	Low	7.9		

Total assessment score (S+E+C)= 0-3 is Low, 4-6 is Medium, and 7-9 is High

From this table, it showed that there are many similarities between TQM and Six Sigma. Both have high credible pay-offs in the categories of company performance. This is not surprising since the financial aspect attracts top managers; therefore, many academicians have published success stories with regards to the company performance. The differences between TQM and Six Sigma are that TQM publications showed higher credible evidence on increasing stock market price, customer satisfaction and total

participation. The last two aspects were also supported by Klefsjö, *et al.* (2006) that Six Sigma has not sufficiently emphasised the TQM value's of everybody commitment and the focus on customer. Nevertheless, Six Sigma showed higher credible claims on reducing process variation, providing formalised and systematic improvement methodology, and motivating intensive training than TQM (see Table 4.5). This finding is also supported by Klefsjö *et al.* (2006), Basu (2004), and Snee (2004) that the advantage of Six Sigma over TQM is the clear project-by-project focus, highly data driven, effective improvement methods, highly structured sequence with clear links to improvement tools, and the readily infrastructure to deploy and implement the approach, which emphasis on education and training.

Numerical results from the matrix diagram were also displayed in a bar chart, to reveal the relative strengths of initiatives in terms of pay-off profile and support rational decision-making (Figure 4.10). Both the pay-off matrix diagram and bar charts are intended as decision-making aids, which can provide managers with a clear idea of the suggested benefits in each category and the credibility or strength of the evidence supporting the pay-off claims.



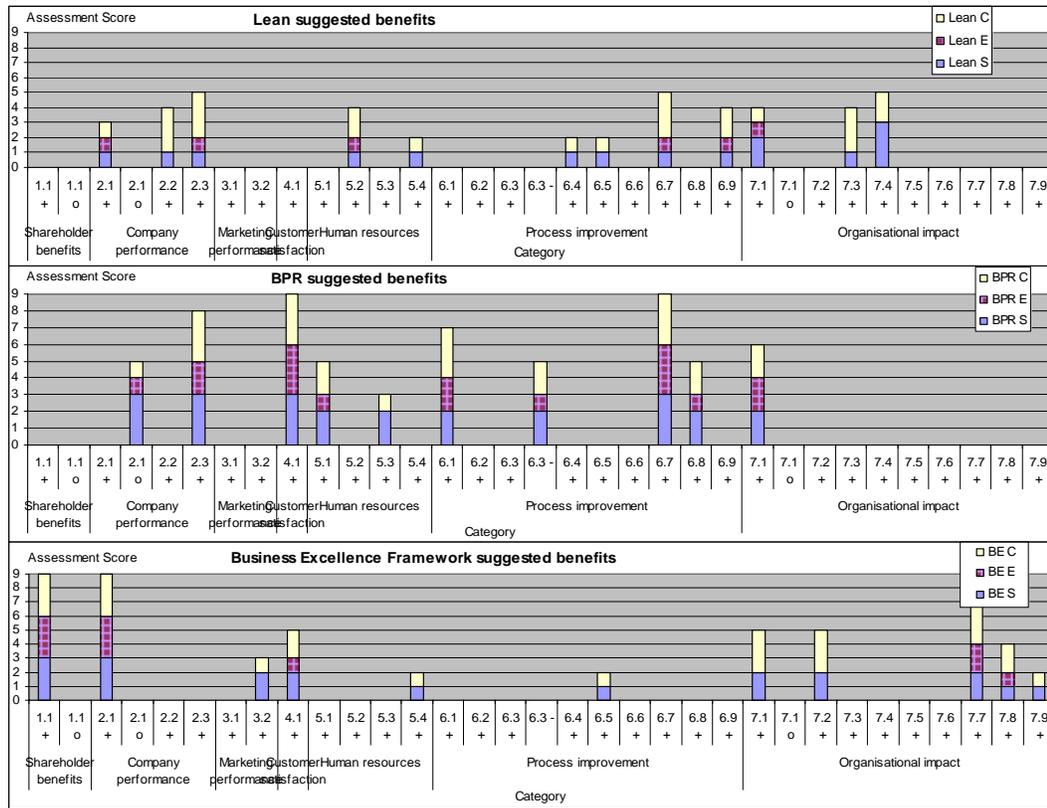


Figure 4.10: Pay-off profile for quality and improvement initiatives

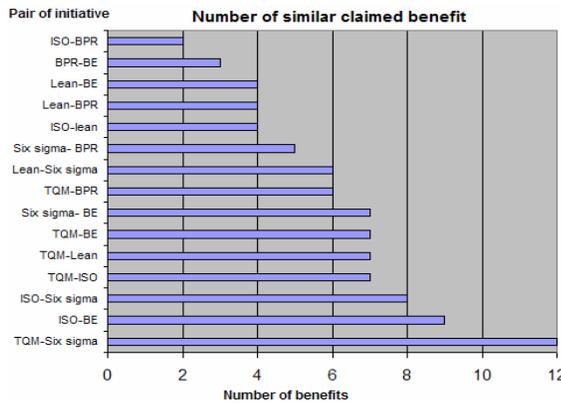
Of the 29 possible benefits listed, TQM made some degree of claim for 14, ISO9000 13, Lean 12, Six-Sigma 14, BPR 10 and Business Excellence 11 benefits. It should be noted that publications which claim benefits for an initiative may also suggest that these benefits are conditional on specific implementation methods, which are not considered here. For example, Poksinska *et al.* (2006) described three ways to implement ISO9001-actively, medium and low - and the approach used will influence the claimed pay-off.

Many benefits are claimed for more than one quality or improvement initiative. The cluster analysis in Table 4.6 and Figure 4.11 shows the number of benefits claimed between pairs of two initiatives. TQM and Six-Sigma show the greatest similarity with 12 shared benefits, followed by ISO9000 and BE with nine, ISO9000 and Six-Sigma with eight. The strength of evidence for claims varies as shown in Table 4.6, but Figure 4.11 reflects only the existence of a claim. The most popular pay-offs, which were claimed for all these six initiatives hence should indicate the core outcomes of a quality

and improvement approach are: 1) Financial performance, 2) Customer satisfaction, 3) Competitiveness and effectiveness, and 4) Reward and recognition.

**Table 4.6: Numbers of similar pay-offs regarding the six initiatives**

29 Benefits	TQM (14)	ISO9000 (13)	Lean (12)	Six Sigma (14)	BPR (10)	BE (11)
TQM		7	7	12	6	7
ISO			4	8	2	9
Lean				6	4	4
Six Sigma					5	7
BPR						3
BE						



**Figure 4.11: Number of similar claimed benefits**

It is important to be aware that many of these evaluations are based on publications which claim pay-offs associated with an initiative, based on successful implementation or best-case examples. Clearly, the effectiveness of implementation may affect pay-offs to the organisation (Poksinska *et al.* 2006). Expectations may also play a part. Case studies of 11 companies in Thailand, which adopted the Six Sigma approach, indicated that the financial savings achieved were related to the anticipated degree of success (Hendry 2005).

#### **4.2.5 Conclusion of 'pay-offs'**

TQM, ISO9000, Lean, BPR, Six-Sigma and Business Excellence initiatives have all been available to companies for many years. During this period, many claims for their effectiveness have been made, often by those who stand to benefit from the adoption of initiatives, such as consultants and certification bodies. The evidence for benefits in the literature is considerable, supported by empirical evidence based on good research, presented by credible authors in strong journals and agreed by many authorities. However, benefits may also be claimed without such strong supporting evidence or with lesser credibility. This is sometimes the case with books which aim to promote new management fashions, employing anecdotal cases presented in the best light to generate interest and enthusiasm among managers. The Pay-off Matrix has been proposed to provide an improved level of decision-support information and help establish the credibility of the various claimed pay-offs. A summary and analysis based on a number of publications can advise managers as to the expected pay-offs of these QM and CI initiatives; as well as pointing to research gaps related to the effectiveness of quality and improvement initiatives. Some of the data presented in the Pay-Off Matrix challenged our preconceptions as to the weight of evidence supporting pay-offs for important initiatives.

This section has attempted to promote a rational approach in selecting management initiatives. The example used was quality and improvement initiatives, but this approach might also be used for other areas where businesses face choices and a considerable body of evidence exists to assist the decision-making process. The strength and duration of management fashions has been measured by many authors using publication numbers. In academic circles, conventional literature reviews are used to discuss and express the strength of evidence in areas of interest. The approach to presentation and assessment of evidence which the author have used attempts to present an alternative method for assessing the nature and strength of evidence in a field.

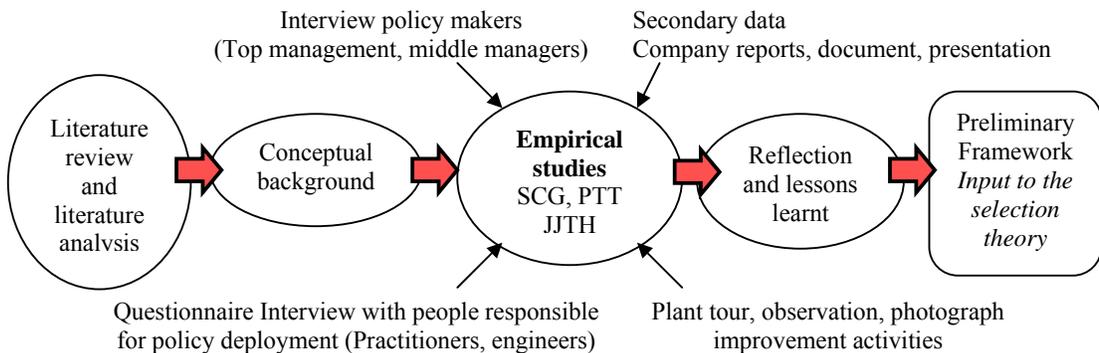
### 4.3 CONCLUSION

Despite the esteem for rational decision-making, reasons to adopt new improvement initiatives are complex and involve several irrational influences. The fashion setting phenomenon is one, whose existence the author proved by identifying trends in academic publication (fashion setters), and comparing to the company usage rate (fashion consumers). With the power of fashion suppliers e.g. academicians, consultants, who disseminate their ideas through influential media such as publications and talk presentations, the future of a particular management initiative's adoption by organisations has been aimed and can fluctuate relative to the fashion prominence at the time. The issue of global and time effect in dissemination, differences in industrial culture, and the influential fashion setters which affect the adoption of these improvement initiatives in the newly-industrialised country using the companies in Thailand as a case study will be discussed in Chapter Five.

Even though the adoption phenomenon beginning with fashion setting seems irrational, there is another element of rationality in it. Claimed pay-offs or suggested benefits associated with the initiative are conveying messages to create and resurface the irrational reasoning to rationality. The presence of pay-offs or the idea's effectiveness has prolonged the life of improvement initiatives. As anticipated from the focus of quality improvement ground, most claimed pay-offs were centred around financial benefits and customer satisfaction. Although some initiatives have expanded their quality scope to a wider business improvement, which could have an impact on other performance aspects e.g. marketing performance, process variation, these QM and improvement initiatives are not a panacea for all organisational ills. Hence, deciding which initiative to adopt entails a deeper consideration of its pay-offs. The more credible it claims, the more reliable the decision will be. The suggested benefits of these six initiatives will be verified by looking at their real impacts on the selected case companies, who successfully adopted the initiative, in the following chapter. These proposed benefits formed one part of the questionnaires for the structured interviews. Moreover, Chapter Six will explore which aspects of these claimed pay-offs appeal significantly important to senior or quality managers and to what extent.

## CHAPTER 5. QUALITY MANAGEMENT APPROACHES IN THE CASE STUDY COMPANIES

This chapter continues to explore the adoption phenomena of quality and improvement initiatives by providing an empirical study of quality management and improvement activities in the three case companies. The development of a CI framework, reasons and motivations for the adoption of initiatives, the effectiveness of improvement activities within the case companies, critical success factors, and employees' attitudes are described and explained. A preliminary framework for selecting improvement initiatives is the key theoretical development described in this chapter. This chapter begins with section 5.1, which presents the conceptual background created from examination of the literature and adoption surveys. The following section 5.2 lays out and describes the structure of key enquiries from the in-depth case study process. Sections 5.3 to 5.5 describe three in-depth case studies of the Siam Cement Group (six business units), the PTT public Company Limited (two business groups and one supporting unit), and Johnson & Johnson Manufacturing Thailand. Finally section 5.7 presents the discussion and conclusion of this chapter. Figure 5.1 illustrates the development process of a preliminary framework from this chapter.



**Figure 5.1: Development process of preliminary framework**

### 5.1 CONCEPTUAL BACKGROUND

A conceptual background for selecting CI approaches was developed using input from both conventional and quantitative literature-based investigation described in the previous chapters. The literature review in Chapter Two provided helpful background to

the nature of quality and improvement initiatives, in addition to both rational and irrational adoption theories. The principles behind this selection decision or the motivation for the decision consist of external and internal drivers. ‘Institutional push’ refers to the external drivers to adoption which are related to competition intensity, environmental dynamics and ‘need pull’ is determined by the need for improvement, enhancement of operational performance, and any crisis that may be facing the company (Leseure *et al.* 2004). With increasingly demanding customers, continuous improvement has become an important part of business policy (Dale *et al.* 2003, p.500). This mindset of continuous improvement encourages the managers to look for new tools and methods. The nature of the fashion environment (fashion setters and fashion consumers) has been discussed; this has raised issues in the general management and organisational behaviour (OB) literature. The literature on operations strategy and strategic decision-making was helpful in clarifying the process of operational decision-making, and the gap analysis, which matches the action plan with a company’s objectives. As suggested by the literature, the three basic questions of ‘Where we want to go?’, ‘Where are we now?’ and ‘How do we get there?’ need to be answered by the framework. The conceptual background was divided into four main elements: motivations, gap analysis, selection criteria, and potential outcomes.

The proposed conceptual background for the selection of Continuous Improvement programmes, depicted in Figure 5.2, is intended to cover a wide range of possible criteria based on organisational behaviour (OB), general management, and operations management (OM) literature. A combination of operations strategy and strategic decision-making concepts was developed as a guideline for a rational decision. The analysis in Chapter Four highlighted two influential factors to be taken into account for the selection i.e. fashion and pay-offs. Summarised from the literature, the criteria to be considered in selecting CI programmes were categorised into four areas: fashion setting, pay-offs, objectives, and constraints. Sub-criteria in the pay-offs category which are claimed to be the benefits from the implementation of TQM, ISO9001, Six Sigma, BPR, Lean, and Business Excellence model were described in the previous section 4.2 and are listed in Table 5.1.

This conceptual background will now be clarified, validated, and further developed by means of the case studies and interviews. The contents and selection criteria of this conceptual framework contain conscious assumptions and relate to the research hypotheses. The appropriateness, relevance, and degree of importance of the criteria and sub-criteria were further explored through interviews and case studies.

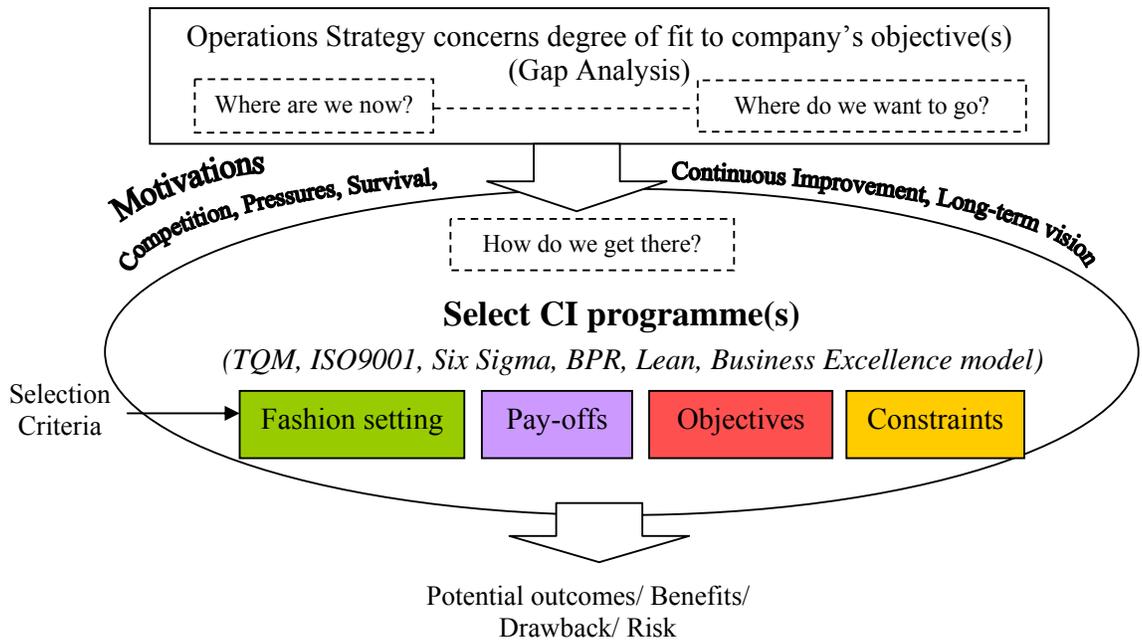


Figure 5.2: Initial conceptual background

**Table 5.1: Selection criteria from literature**

Selection criteria	Reasons to adopt	Reference	Sub-criteria
Fashion	The most up-to-date programmes show lower alignment with competitive priorities and the adoption of management ideas is correlated to fashion suppliers/ setters eg academics, consultants, so called 'fashion setting organisations.'	Abrahamson (1991:1996); Williams (2004)	- New Trends
	Conversation with peers, testimonial of successful implementer, case study, and competitors' financial results.	Weiler (2004)	- Persuasion from gurus, consultants, academics
	- Dramaturgical view or persuasive power of gurus, consultants, academics, trainers, authors - Political view to secure power - Psychodynamic view e.g. anxieties, yearning, and the need for autonomy and belonging - Institutional view	Sturdy (2004)	- Follow best practices by information from conversation with peers, colleagues' recommendation, books, and internet search
	Information and selection of quality improvement approaches mostly came from customers, and colleagues' recommendation, and internet searches	Charlesworth (2000)	
	- Emotional accounts (Charismatic consultant, Distancing approach or senior managers suggest the change programme to keep the distance between themselves and middle managers) - Fashion (Institutional theory: resembles the lead taken by others in the field)	Grint (1997)	
Pay-Offs	Perception of practical, benefit and relevance	Clark & Greatbatch (2004)	Seven categories of payoffs from CI initiatives:
	Evaluating a business approach according to the pay-off and endurance.	Miller & Hartwick (2002)	- Shareholders benefit
	Empirical evidence on effectiveness	Gibson & Tesone (2001)	- Company performance
	- Pay-off and experiences on improvement programmes - Internal and External environment.	Cagliano & Spina (2000)	- Marketing performance - Customer satisfaction - Human resources - Process improvement - Organisational impact
Company's objectives	- Based on objective and systematic evaluation - In response to particular crisis - Causal link to organisational performance.	Sturdy (2004); Grint (1997)	- Company's objectives
	Objectives and performance measures	Tan & Platts (2003:2004)	- Company's needs
	-Satisfy organisation's needs -Competitive priorities	Gibson & Tesone (2001)	
	- Strategic Priorities	Cagliano & Spina (2000)	
Constraints	Cultural view	Sturdy (2004)	- Organisation's culture
	Outcomes, high priorities to company, and company capabilities and resources.	Miller & Hartwick (2002)	- Cost and time to implement - Required resources
	- Organisation's culture - Resources - Cost of implementation and time to result - Minimise risk and change management.	Gibson & Tesone (2001)	- Company's capability

## 5.2 FRAMEWORK DEVELOPED THROUGH IN-DEPTH CASE STUDIES

Three in-depth case studies were carried out to provide empirical evidence of the improvement activities, quality management development and the initiatives adopted, which are explained in each case context. The historical decision process, motivations for adoption, and the selection criteria used are revealed and explained. Improvement activities, their effectiveness, benefits and impacts on the company, and feedback from employees are provided. Each case study describes the past, present and the anticipated

future agenda of organisational and quality improvements. Brief descriptions of all cases are summarised in Table 5.2. Lists of all interviewees are given in Appendix 11.

**Table 5.2: Summary of case companies' background**

Cases	Industry sector	Revenue 2005 (Billions USD*)	Number of employees 2005	Number of years with CI approaches	Adopted improvement approaches
SCG	1. Paper and packaging 2. Petrochemical 3. Cement 4. Building products 5. Distribution	\$ 5.46	19,000	27 years (92 years in the business)	TQM ISO9001, ISO14000, ISO17025 Deming prize and Thailand Quality Award
PTT	Energy conglomerate 1. Oil business 2. Gas business	\$ 24	5,698	21 years (27 years in the business)	5S, Suggestion system, QCC, TPM, TQM ISO9001, ISO14001, ISO18000, IEC guide 25, ISO17025 BPR, Six Sigma, cleaner technology, green label, ODOP Thailand Quality Award
Johnson & Johnson Thailand	Consumers manufacturing companies for Asia Pacific region 1. Sanitary protection 2. Powder products	\$ 0.13 \$ 50.5 (corp)	358	6 years (20 years as manufacturing plant in Thailand)	GMP, ISO14000  Process Excellence (Six Sigma, Lean, DEX)  Cost Improvement Program (CIP)
Advanced Info Service (AIS)	Telecommunication	\$2.41	4,930	Just started TQS in 2005 (19 years in business)	TQM
Toyota motor Thailand (TMT)	Automobile	\$7.65 \$158 (corp)	12,593	43 years (43 years in business)	Toyota Production System (also known as Lean manufacturing), ISO9001, QCC, SQC

\* Exchange rate based on 40 THB/ US dollars and all data based on year 2005  
References: Company's annual report, Company's corporate profile, Company's website, Information from interviews, Finance department of the case company, Datamonitor

### 5.3 CASE A: THE SIAM CEMENT GROUP (SCG)



Under the business philosophy of ‘Quality and Fairness’, the Siam Cement group has set up the Total Quality Promotion Centre (TQPC) at the corporate level. This centre reports directly to the President, to give advice and promote TQM practices for all SCG businesses. TQPC is responsible for the overall practice of QM and CI at SCG.

#### 5.3.1 *The development of quality management at SCG*

The Siam Cement Group is Thailand’s leading TQM company. The process of TQM adoption chronologically compared to business development at SCG as described in Chapter Three is summarised and illustrated in Figure 5.3. This figure shows that quality management and improvement initiatives have been introduced to SCG’s organisation since the late 1970s during the growing period of the SCG business. It began with Quality Control Circle (QCC), a management fad during the 1970s which became a fashion during the 1980s, and decreased in popularity in the late 1980s (Abrahamson 1996). At SCG the QC activity was also progressing from fad to fashion; however unlike other firms, it still continues and was embedded in a newer fashion called ‘TQM’ in 1992. The process of TQM implementation at SCG has shown that regardless of the business situation (growth, fluctuation, or sustain) or the business size, TQM persists and fits into the SCG organisation as a business framework. Key success and sustainability factors of TQM at SCG are the continuous support, and clear and strong emphasis on QM from all SC Presidents (C1.1, C1.2, C1.5). The author named this process ‘the adoption of a sustainable management idea’ (see details in Chapter Six).

The Director of TQPC described and summarised the development of Total Quality Management at SCG in three phases: Phase 1: Productivity Improvement from 1978 to 1991, Phase 2: Total Quality Commitment from 1992-2001, and Phase 3: Total Quality Management from 2002 onwards. Information from both interviews with the Director of TQPC and the company’s documents (Angkanarak 2004) reveal the major activities at each phase, as summarised in Table 5.3.

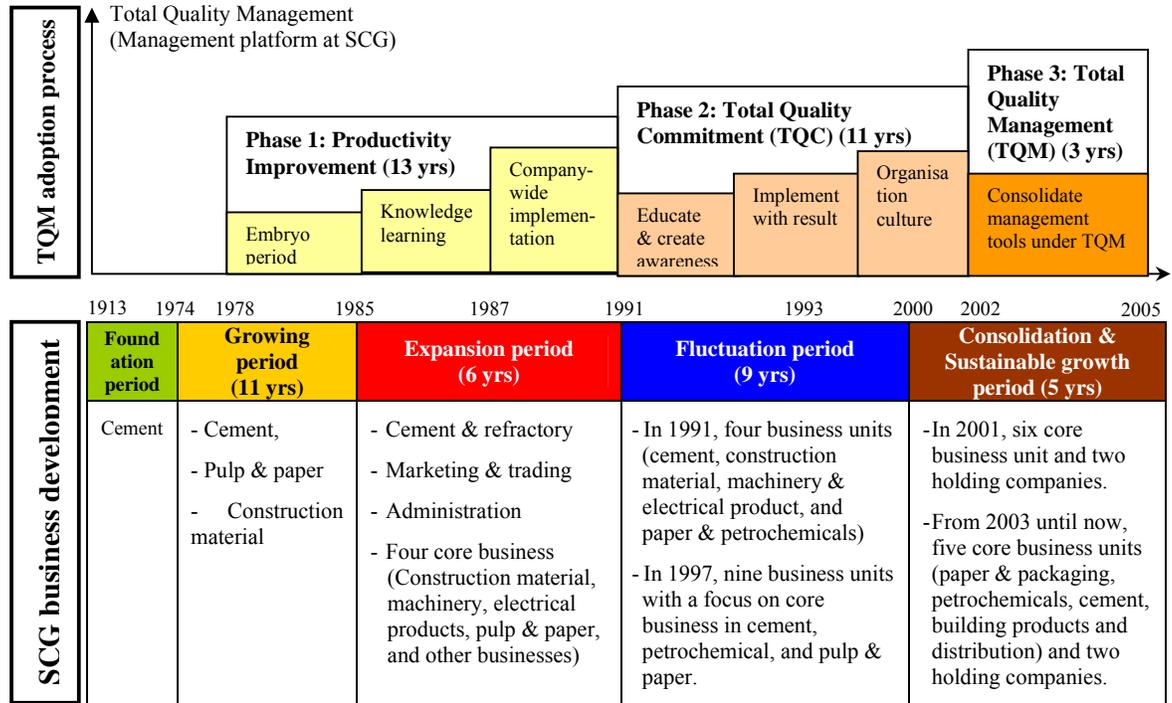


Figure 5.3: Process of TQM adoption and SCG business development

Table 5.3: Quality Management development at SCG

Phase	Sub events	Objective	Major activities
Phase 1 (1978-1991): Productivity Improvement	Embryo period (1978-1984)	Introduce and disseminate throughout SCG	<ol style="list-style-type: none"> <li>1) Quality Circle at Siam Nawaloha company (foundry business) in 1978</li> <li>2) Management By Objectives (MBO)</li> <li>3) Executive team attended the International Productivity Conference in Tokyo</li> <li>4) Established "Productivity Improvement Co-ordination Committee-PICC" in 1983 to promote PI and QI</li> </ol>
	Knowledge along with Implementation (1985-1987)	Knowledge Learning by Study mission team	<ol style="list-style-type: none"> <li>1) Visit various Japanese companies to observe Total Quality practices</li> <li>2) Visit leading companies in USA (Westinghouse, IBM, 3M) and also American &amp; Japanese productivity organisations (APC, JPC, JMA, APO)                             <ul style="list-style-type: none"> <li>*Looking for consultant services</li> <li>*Study concept and method of leading companies especially white collar</li> <li>*Find out world-class PI information centers</li> </ul> </li> <li>3)Invited executives from MHI, Westinghouse, Nomura, Shell Singapore to share experience with management</li> <li>4) Expert from Westinghouse conducted productivity assessment program and submitted suggestion to PICC; however, the suggestion was not adopted.</li> </ol>
	Company-wide implementation (1988-1991)		4 activities under PICC: Quality circle, 5S, Suggestion, and Safety
Phase 2 (1992-2001): Total Quality Commitment			<ol style="list-style-type: none"> <li>1) 4th Jan 92, Executive committee decided to implement Total Quality Control-the Japanese way. SCG called TQC (Total Quality Commitment) because:                             <ul style="list-style-type: none"> <li>* Joint venture with Japanese companies</li> <li>* Good plant management and business performance</li> <li>* Similar Asian Culture</li> </ul> </li> <li>2) Set up "Total Quality Promotion Center-TQPC" reporting directly to the president</li> <li>3) Invited Prof.Dr.Kano as consultant team leader</li> <li>4) Announce TQC Policy</li> </ol>
Phase 3 (2002 onwards): Total Quality Management			<ol style="list-style-type: none"> <li>1) Emergence of numerous management tools such as BSC, Six Sigma, TPM which can be complementary to TQC</li> <li>2) Change TQC to TQM and use as umbrella to integrate other tools as appropriate</li> </ol>

From 1978 to 1984, Total Quality Management was introduced in an embryo period aimed to improve productivity. Its activities began with Quality Circle in Siam Nawaloha Company, Management By Objectives (MBO), and the establishment of the 'Productivity Improvement Co-ordination Committee (PICC) promoting productivity and quality improvement. 1985 to 1987 was a period of knowledge learning by a study mission team which aimed to find management best practice to be employed in SCG. Then from 1988 to 1991, four activities (Quality Circle, 5S, Suggestion System, and Safety) were implemented across the group under the PICC. In hindsight, 1992 was the actual starting point of TQM implementation at SCG since Total Quality Commitment, or the Japanese way of total quality control, was chosen and began to be deployed at SCG. The TQC policy was announced and the Total Quality Promotion Centre (TQPC) was set up and reported directly to the President. The TQC Policy stated that:

'In an ever changing environment and increasingly competitive situation, SCG has adopted TQC for its companies to use in managing business in order that they can sustain growth in a solid way. TQC aims at satisfying customers with products and services. Hence employees at all levels and from all functions must have the mindset to improve their own work as well as work that relate to others in a systematic and continuous manner.'

SCG was not only the first Thai company to establish the Quality Circle programme and TQM, but also the first Thai cement manufacturer to be certified to ISO9001 in 1994, and ISO14000 in 1998. Although ISO9001 started in 1984 and was announced in 1987, it was first introduced in Thailand by the Thai Industrial Standard Institute (TISI) around 1993, and SCG was the first group to implement it. The Director of TQPC said

'The adoption of TQM in SCG since 1992 can be divided into three periods: 1) start to educate and alert people to the flavour of TQM, 2) implement it with big progress, and 3) continue to adopt TQM long enough until it becomes an organisation's culture, which people work with every day. Some companies took up the challenge for some awards and then TQM activity booms again.' (C1.1)

From 2002, Total Quality Commitment has been changed to an internationally accepted name – Total Quality Management (C1.1). Numerous management tools which have emerged later, such as Balanced Scorecard, Six Sigma, and TPM, were integrated under the umbrella of TQM. The Marketing Planning Department manager of Thai Paper said 'We did not throw away the old programme but added a new tool, which can brighten our existing system or fill in our gap, with the old one and not to replace it,' (C1.5). Similar to recent business development in SCG which concentrated on consolidating

several companies under five core business units, the adoption of new initiatives is followed by the integration of all old and new tools under the quality management framework of TQM.

### ***5.3.2 Quality Management position***

A function responsible for quality management and continuous business improvement is positioned at each business unit in the organisation's structure. However, this position may be named and placed differently in each business unit. It depends on the degree of emphasis, perceptions and needs in quality management function of that company. The Quality Management manager at CCCP said: 'Each enterprise has a different nature of business and requirements, unequal competition level, and different level of understanding in TQM; therefore, there are differences in TQM attention and the way to promote it' (C1.2). Appendix 18 illustrates SCG organisation's structure and QM positions.

Usually the earlier established business units e.g. cement and petrochemicals businesses have assigned this quality management duty to a specific quality management department, which reported directly to the president of that company. However, the paper and packaging business has allocated the quality management task to the marketing and planning department. Additionally, the two newly formed business units of building products and distribution business have also attached their quality management tasks to the organisation development department and business planning office respectively. The Organisation Development (OD) manager at Building Business said that 'the main agenda of the OD is to develop leadership and innovation focusing on closing the organisation's gaps, as their scope is broader than quality and continuous improvement' (C1.3).

Is a dedicated quality management department necessary? It is noticeable that later SCG business units perceive quality management as a ground task or daily work for everyone in the organisation; however, innovation and organisational development are a new focus and have a broader duty, which requires a specific function to stimulate, create and make changes. Therefore, the newer business units of SCG seem not to have a specific QM department but assign this function to other departments, e.g. organisation

development, business planning, and marketing planning department. The evolution of the QM position is also in response to the enlargement in the scope of the CI concept, which is now focusing on organisational excellence and wider business issues as described in Section 2.2, Chapter Two.

Having a separate quality management department does not determine the success of QM. However, a strong leadership in TQM is indispensable for this achievement. For example, the Thai Paper company, which received both the Thailand Quality Award and the Deming prize, does not have a specific QM department but has a strong TQM leader. CCC Polyolefin and SRIC both have a dedicated QM department and leaders who have confidence in TQM, which resulted in their being awarded the Deming prize. The Managing Director and Quality System Manager of SRIC said that ‘During the Asian economic crisis, many companies in SCG had ceased their TQM programme but we believed TQM could help us and it helped us indeed’ (C1.7, C2.2). The QM manager at CCCP also explained that the success of TQM depends on the leadership at every level in each company, and also their leadership must be visible, clear, and focused to deploy TQM to the whole organisation (C1.2). In SCG, not only does its business philosophy give high importance to quality, but its people also realise and believe in the necessity of quality and continuous improvement according to the constant emphasis on TQC policy from all SCG Presidents, ten interviews with executives and senior managers, and forty-one feedback questionnaires from the Siam Refractory Industry Company (SRIC). Therefore, strong leadership and belief in quality management, the company’s dedication to quality, and constant motivation in quality awareness are major factors in successful quality management at SCG, rather than a visible QM department.

### ***5.3.3 Importance and triggers of QM and CI at SCG***

A majority of SCG companies define continuous improvement (CI) as small, incremental improvements or Kaizen, especially in routine work. The QM manager at CCCP described CI activities in this way: ‘To do continuous improvement, we must have a standard and improve from the standard rather than improve from nothing. Once we have a platform, it is a good starting point’ (C1.2). The Director of TQPC and Managing Director of SRIC also gave the same viewpoint that although other

companies may include Breakthrough Improvement (BT) in CI, SCG does not consider BT as a part of CI and now SCG should have both CI and BT in order to be world-class (C1.1, C1.7).

Quality has always been a high priority to the Siam Cement Group as well as the mindset of continuous improvement, which is related to quality and has been indoctrinated into SCG people. The Director of TQPC emphasised that “CI is necessary in SCG and almost all basic activities in SCG have CI. For example, daily work uses ‘daily management’ as CI; ‘ISO9001’ itself has CI; and ‘safety & environment’ also have their own CI.” The OD manager at the building products business added that:

‘CI is the heart of business. It responds to customer needs, which are increasingly higher. The knowledge of our customers is higher; they increase their demand together with their higher negotiation power. Therefore, CI is necessary to 1) maintain basic quality according to customer needs and 2) compete with our competitors who have higher quality. Both aspects are quality issues.’ (C1.3)

Similarly, the Business Planning Office manager at Cementhai Distribution agreed on the necessity of CI to cope with the rapidly changing business environment and especially to compete with new foreign competitors, who entered the market and increase competition in the environment (C1.6). Additionally, the Marketing Planning Department manager of Thai Paper said:

‘We believe that our customers’ requirements have become more demanding and at the same time not only because of the customer but higher innovation from people in the same industry. If we stay without improvement and our quality does not meet their needs, we will be out of business.’ (C1.5)

The Managing Director of SRIC also stressed that:

‘CI is very important and essential especially to the organisation which is just starting TQM or employs this system. CI has shown why and how TQM helps SRIC to become a core unit in SCG again after a crash in the Asian economic crisis.’ (C1.7)

The QS Manager at SRIC also agreed that priorities were to overcome the crisis offering world-class quality in order to delight customers and integrating the management system to achieve outstanding results (C2.2). Hence, a keyword to the significance of CI in SCG is survival and for company competitiveness through the focus on customers and quality, as supported by ten interviews with senior managers. With a strong CI perception, SCG introduced many activities to ensure its leading status.

### 5.3.4 *The approaches adopted overall*

The Siam Cement Group includes more than a hundred companies. Each subsidiary company has the flexibility to choose its own approach for continuous improvement; therefore, many new initiatives have been adopted and tried here. None of SCG's senior managers said their business units follow Six-Sigma, or Lean principles. However, core programmes, which all five business units chose and unfailingly practise to pursue continuous improvement, are **Total Quality Management, ISO9001, and Excellence self-assessment by Deming prize, Thailand Quality Award, or Prime Minister Awards**. According to the Director of TQPC,

‘Although some other initiatives such as Balanced Scorecard have just been introduced into the group, it was perceived as a management tool under the framework of TQM. Similarly, Reengineering – (i.e. reprocessing, breakthroughs in system, or changing to new working processes) – is considered as one part of TQM. We have CI in all areas. Fact base and statistical tools are the main CI components in both Six Sigma and TQM. Although we did not follow Six Sigma principles, we use some parts of Six Sigma as problem solving and statistical tools under TQM.’ (C1.1)

The Managing Director of SRIC argued that the foundation for CI should be statistical knowledge, capability for analysis, and flexibility to use all vehicles or tools (C1.7). He also perceives BSC or Six Sigma as a tool under the big framework of TQM. In summary, pursuing Continuous Improvement at SCG, the adopted approaches or activities were composed of fact base, statistical tools and analysis. TQM has been strongly promoted and implemented here as a management platform for more than 15 years. All other adopted initiatives and management tools such as BSC, BPR, or Six Sigma were placed under this TQM umbrella of SCG.

### 5.3.5 *Total Quality Management at SCG*

Unlike other initiatives which perform with a project-by-project nature and have start-and-finish points, TQM, on the contrary, once fully implemented, becomes an organisation's culture (C1.1). The key components of TQM in SCG consist of 1) concept and model, 2) policy management, 3) daily management, 4) cross-functional management, and 5) bottom-up activity such as QCC, suggestion system, and 5S (C1.2). Dr. Kano has regularly been the TQM consultant, educating, training and providing the TQM concept and framework for SCG since 1992. Giving SRIC as an example, the concept and framework of TQM in SCG can be depicted as follows. The Managing

Director of SRIC explained the philosophy of TQM under four headings: 1) customer-oriented, 2) systematic work by using statistics, 3) continuous improvement, and 4) increase employee participation (C1.7). These concepts are then applied to the TQM framework below or SCG's House of TQM as shown in Figure 5.4.



Figure 5.4: House of TQM at SRIC

However, the degree of TQM implementation at each business varies depending on how people understand and implement it. The Quality Management manager at CCCP said ‘This could be called the weakness of TQM which does not have a systematic format or exact roadmap of how to become a TQM organisation. TQM is a concept and is very much subjective; therefore, its interpretation and usage is mostly from top management’ (C1.2). Although there are many quality techniques employed under SCG's house of TQM, the most commonly used tools as mentioned during the interviews from each business unit are 7 QC tools and 7 new QC tools, which are characterised as problem-solving tools, QFD and DOE. Apart from these tools, Balanced Scorecard, PFMEA, and other statistical tools have been utilised in some areas. Also other techniques such as QCC, Suggestion System, Task Achievement, SWOT, Medium Term Plan, Risk Management and CRM, have been applied.

### 5.3.6 The reasons for TQM, ISO9001, and Quality Awards

‘Our purposes of implementing these CI programmes are for sustaining competitiveness in the long run, survival, and creating value for people and customers’

(Business Planning Office manager at Cementsai Distribution, C1.6).

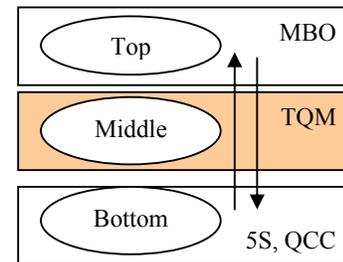
According to all interviews, the decision-making of whether or not to implement TQM, ISO, or any other initiatives always came from top management level; nevertheless, employees could decide which quality tools were suitable for their work. Senior managers at each business unit in SCG have explained the reasons for SCG's choice to pursue the Japanese approach of TQM, apply for quality awards, and the ISO certification. In the big picture, the most important reasons for the adoption of these improvement initiatives in SCG are 1) company's competitiveness, 2) enhancement of

customer satisfaction, and 3) improvement of productivity, product/service quality, and process/working system in sequence. Most interviewees deny fashion as their reason and more than half said that the adoption is not to enhance the company's reputation. Similarly, six out of ten senior managers do not believe that reducing amount of resources usage is a reason. Appendix 19 illustrates the ranking. Although the irrational influence of fashion setting in decision-making was not explicitly accepted, the Quality Management manager of CCCP linked the fashion issue to customer satisfaction as to his rational explanation:

'I accept that fashionable programme is also a reason for the adoption. If our customers do not understand how we work, they may doubt whether we would work systematically and be their good supplier or not. If they know we have a good working system, our customers must be contented, satisfied, and feel that we are reliable.' (C1.2)

**a. Why TQM: Japanese TQM and Thai culture?**

Ten years ago, TQM deployment was a top-down policy to all companies under the Siam Cement group, not a decision from any subsidiary company. The purpose of adopting TQM into SCG at the beginning, according to the Director of TQPC, was to close the gap of middle communication between top and bottom. As he explained:



'Before having TQM, SCG always focused on productivity improvement started by using bottom-up activity such as 5S, QCC, suggestion system particularly at the low level; while the top level generally used Management By Objective (MBO). The problem was that MBO was only known at the top level; while low-level workers did not understand why this was done and why this direction was taken. Many cases were kept secret. We know that there is a gap in the middle, which is the communication between the top and low levels.' (C1.1)

As a consequence, SCG had explored all tools and techniques that they should use to link top and bottom. This was done by the SCG fact-finding team. This team comprised ten people from SCG. They surveyed, and visited many foreign companies in Europe, the United States, Japan, and Singapore and discussed their findings at the management committee when they returned to Thailand. The study identified strengths, weak points, and major concerns of various implementation programmes. This study was intended to answer 'which tools or concept are appropriate to their organisation?' and 'how much did they need to change, all people and culture?' All these were their consideration

factors. This process lasted for a year until the executive board could make the decision to adopt TQM. According to the Director of TQPC, there are three major reasons for SCG to adopt a Japanese version of TQM: 1) successful companies in Japan used TQM (fashion setting) with good result (pay-offs), 2) TQM logic is usable for policy management (objective), and 3) the similarity between Japanese and Thai culture i.e. Asian culture (C1.1). Particularly SCG believed that the similarity between Japanese and Thai culture would lead to successful implementation (organisation fit). Most consultants and experts in SCG at that time came from Japan (fashion setting) and this was probably the reason for SCG to base TQM on the Japanese approach (C2.1). The Managing Director, the Quality System manager of SRIC, and the Marketing Planning Department manager of Thai Paper agreed that SCG laid down their direction through MBO and TQM because the methods were suitable to Thai people and Thai culture (organisation fit) (C1.7, C2.2, C1.5). They further related TQM to the characteristics of Thai people and society, as summarised in Table 5.4.

**Table 5.4: Thai characteristics and the reasons for TQM**

Thai characteristics and culture	Why TQM?
Submissive	- TQM enhances people participation e.g. QCC activity
Not as outspoken as American or Caucasian	- Japanese approach is a soft-tone approach, which encourages bottom-level employees to express themselves. - TQM is a good foundation and is able to be used in Thai society
Lack of statistical method and Thai people usually based problem analysis on experiences rather than systematical study.	- Problem-solving concept and tools e.g. 7 QC tools help analyse problem more systematically and systematically build people to have a better understanding - Without finding root causes of problem before fixing the problem, defects are found repeatedly. It's a big decision to move towards TQM after comparing between Western and Japanese approach in the last 10 years. - TQM increases human productivity
Generally laid-back e.g. the way people worked in the past 30 years, they still do the same now.	- Therefore, deploying <i>continuous improvement</i> or what the Japanese call <i>Kaizen</i> through QCC group, collecting statistical data and employing QC tools to analyse and solve problems is essential.
Thai culture cannot accept fast changes	- TQM slowly changes working behaviours
Respect seniority and older people	- Therefore, there may be some problem with Western working style in Thai culture.

In summary, the motivation to adopt TQM in SCG organisation started with realising the problem or the gap in the company's operational strategy. Then the process of selection began by searching for best practice and finalised the decision based on criteria, which supported the four categories in the conceptual background (see Figure 5.2) i.e. Fashion setting, Pay-offs, Objective, and successful implementation regarding

Thai culture as one essential consideration. The author renamed the last criterion as organisation fit, which concerns the success of the implementation process.

***b. Why ISO9001 standard: for the sake of the certificate rather than internal improvement?***

SCG has adopted the ISO9001 standard in order to acquire the certification or a trademark which indicates that the company has a system, rather than truly implement for improvement. The QM manager at CCCP described that:

‘ISO9001 came adjacent to Total Quality Control. However, at that time we did not use ISO9001 for continuous improvement but only for standardisation i.e. ‘write what you do and do what you write.’ The adoption of the ISO system came like a wave of fashion or trademark that we must have in order to declare that we have a work standard.’ (C1.2)

The Business Planning Office manager also agreed that Cementhai Distribution has adopted ISO9001 because of customer demand (C1.6). The Director of TQPC said that:

‘I think this is the reason for all other companies in Thailand. The only advantage of ISO9001 version 1994 in SCG perception is that it arranges regulation, working procedure, standard and method, which could be a strong foundation for continuous improvement. ISO9001 version 2000 expands the focus to continual improvement without limit; it moves towards TQM. Nonetheless, ISO is better than TQM, because the company would receive a certificate.’ (C1.1)

The QM manager at CCCP explained ‘at the beginning we thought TQM and ISO9001 were different subjects, but later we found that both have some parts that supplement each other. Having ISO9001 is like having a platform, a standard and a good starting point for continuous improvement’ (C1.2). The Managing Director at SRIC also gave the same opinion that ISO9001 is a fixed rule and regulation, which is compulsory for business. On the contrary, he did not think that ISO is a foundation for CI since, in his opinion, the foundation for CI should be statistics knowledge and analysis capability (C1.7). He explained that SRIC easily became certified ISO because the company previously had CI foundation which was grounded in analysis, and utilises statistical tools.

In summary, the perception of the importance of the certified ISO9001 standard in SCG is particularly for certification as a trademark and for marketing purposes. Although internal benefits such as improvement of working standards were mentioned, more emphasis was placed on external motivation factors i.e. customer requirements and the

marketing factor. This finding is supported by the survey of Thailand Productivity Institute (1997, 1999) of 477 organisations (348 manufacturing and 96 services) in Thailand stating that there are both internal and external benefits from implementing ISO9001. Table 5.5 summarises the reasons for implementing ISO9001 from literature. Like other countries where ISO9001 has become a fashion since the 1994 version (for the increase in the number of ISO9001 certificates worldwide published by BSI in 2005 see Appendix 2), most companies in Thailand perceived the internal benefits from implementing ISO9001 as more important than external ones (TPI 1997, 1999). On the other hand, the adoption of ISO9001 in SCG is mainly for the certification or the external factor.

**Table 5.5: Reasons for implementing ISO9001 from literature**

Why ISO9001	Descriptions	References
1) Improve internal organisation	<ul style="list-style-type: none"> <li>• Improve quality, efficiency, communication/ increase market share, reduce cost, higher stock price, and achieve competitive advantage</li> <li>• Achieve process improvement</li> <li>• Demonstrate the management commitment to quality</li> <li>• Offer a model and a process for continuous self-assessment against an internationally recognised standard and a credible QMS</li> <li>• Basic Foundation for TQM</li> </ul>	<p>Najme &amp; Kehoe (2001); Zhang (2000)</p> <p>Withers &amp; Ebrahimpour (2001)</p> <p>Gupta (1997)</p> <p>Fuentes <i>et al.</i> (2000); Anderson (1999)</p>
2) External motivational factors e.g. Customer pressures and market related factor	<ul style="list-style-type: none"> <li>• ISO certification allows organisations to be recognised for the company’s quality by a 3<sup>rd</sup> party</li> <li>• Certification is used for marketing purposes – ‘Corporate Image’</li> <li>• Anticipated demand from future customers</li> <li>• Remove trade barrier supported by studies in Spain, Australia, New Zealand, Greece, Sweden, Taiwan, the USA, Ireland</li> </ul>	<p>Lipovaz <i>et al.</i> (1999); Fox (1994)</p> <p>Buttle (1997), Van der Wiele, A. <i>et al.</i> (2001)</p>

*Adapted from Magd & Curry (2003)*

**c. Why Quality Awards: Fashion leader and a revival of TQM?**

For SCG, Quality Awards have been applied since 1986 as a top-down policy before any international quality award such as MBNQA, Deming, and EFQM were established. The purposes of applying for awards in the past are different from the present. With the fact that SCG is a big and successful Thai conglomerate the award committees, who were mostly from the Thai Ministry of Industry and Labour, invited SCG to apply for the award (C1.1). They perceived that if SCG joined, it would enhance the award image (C1.4.1, C1.4.2). Hence, SCG had to cooperate. The Director of TQPC, the Planning manager and the QM manager at the Cement business similarly mentioned that ‘Whatever award is introduced in Thailand, we unfailingly join it. I

cannot tell which award came first since many awards started at the same time e.g. Award in Labour force. It depends on how the Ministry named it' (C1.1, C1.4.1, C.1.4.2). Apart from the fact that participating in these awards enhances the company's image by portraying it as a fashion leader, many SCG companies have found many implicit advantages from joining the Quality Award and these are a reason to continue.

The Director of TQPC pointed out that the Deming prize is more comprehensive than TQM. He said 'during the process of applying for the Deming prize, it restored and made TQM a full system and enhanced consistent understanding about TQM to everybody in terms of customer, fact base, problem-analysis tools' (C1.1). From ten interviews with top quality management representatives at each business unit in SCG, similar purposes for applying for quality awards are thus:

- A catalyst to continuous improvement, to alert and accelerate people to move faster and be active in TQM with right direction.
- Feedback to reveal the company's weakness and improvement points.
- A measure as to how well the company employs TQM or so called 'TQM diagnosis.'
- An award which shows the success of TQM implementation, creates good will, and as a by-product, creates reputation.

Nevertheless, there are some shortcomings of Quality Award applications. Although quality awards help to stimulate improvement, this is intermittent and does not stay long or remain continuously because once the company has received an award, there is no mechanism to ensure that the company would continue to retain its standard. Unlike ISO9001 which has a certified period, the received Deming prize can be used forever. Additionally, awards do not tell a company how to improve; they only tell what the company lacked after the assessment. Both CCCP and SRIC have already received the Deming prize but not TQA, and they do not intend to apply for it. Likewise, Thai Paper did not apply for more awards, after receiving both Deming and TQA. The Marketing Planning Department manager of Thai Paper said 'it is not necessary to put effort for the same result and the Deming prize itself has already proved the company's achievement in quality' (C1.5). The Managing Director, Production manager, and the Quality System manager at SRIC added that SRIC did not apply TQA or adoption of MBNQA

(American approach) since MBNQA is a fixed model and has a clear procedure; while the Deming prize is tailor-made, and is more suitable with a loose philosophy of SRIC TQM based on Kano's house framework (C1.7, C2.1, C2.2). Moreover, they do not want to create confusion in their organisation and in their opinion the Deming prize is superior to TQA. SRIC's next goal is pursuing the Japan Quality Medal, which is a higher level or higher criteria of TQM. Unlike TQM which is promoted and deployed throughout the SCG organisation, the decision about which Quality Awards to apply for depends on individual business units. The Director of TQPC said

'We generally do not promote awards; we will promote it only if some business units have tried it and it proved to be successful. Moreover, if they think they have it for their own benefit then they will compete for an award. We did not give tangible incentives or money for business unit who received an award but there are intangible incentives i.e. we will report their award to the management committee.' (C1.1)

In conclusion, there are many reasons for adopting each CI initiative at SCG and their weights were varied. For the case of TQM, the Japanese version, heavy weight was given to its being complementary to Thai culture (fitness to organisation). ISO9001, on the other hand, was decided upon because of the benefits of its certification as a trademark to assure international QM standard in SCG (pay-offs). Unlike the desire for ISO certificate, SCG pursued the Deming prize with an aim to diagnose and stimulate its TQM implementation (pay-offs). All these motivations for the adoption can be grouped into four categories: Fashion setting, Pay-offs, Strategic fit, and Organisation fit (more explanation is given in Chapter Six). Table 5.6 summarises the reasons for the adoption of each QM initiative based on interviews with senior managers.

**Table 5.6: Summary of reasons to the adoption of CI initiatives in SCG**

The adopted initiatives	no.	Specific reasons and motivation for the adoption	Category	References (Interviewees)										Sum		
				C1.1	C1.2	C1.3	C1.4	C1.5	C1.6	C1.7	C2.1	C2.2	C2.3			
TQM	1	Policy from SCG	S		1	1	1	1	1	1	1	1	1	1	1	9
	2	Suitable to Thai culture	O	1	1			1		1	1	1	1	1	1	7
	3	Successful companies in Japan used TQM with good result	F	1				1		1			1	1	1	5
	4	Japanese consultant and expert in SCG	F									1	1			2
	5	TQM logic is usable to close the gap between top and bottom as middle communication i.e. Policy management	P/S	1	1											2
ISO9001	1	For certificate as a trademark to declare that the company has a system and for marketing purpose	P	1	1		1	1	1	1	1					7
	2	Working procedure, documentation, and standardisation	P	1	1	1				1		1	1	1	1	6
	3	Foundation for CI and compliment to SCG's TQM	P/O	1	1							1	1	1	1	5
	4	Fashion leader	F	1	1		1					1				4
Quality Awards (Deming prize, Thailand Quality Award)	1	'TQM diagnosis' to measure how well the company employ TQM	P					1	1	1	1	1	1	1	1	6
	2	Illustrate the success of TQM implementation, good will, and by-product, creates reputation.	P					1		1	1	1	1	1	1	5
	3	A catalyst to CI as it alerts and accelerates people to TQM	P/S/O		1	1		1				1	1			5
	4	Reveal company's weakness and improvement points	P		1			1				1	1	1		4
	5	Deming prize is tailor-made, which is more suitable with a loose philosophy of SRIC's TQM	O							1	1	1	1			3
	6	Request by Thai ministry	F	1			1									2
	7	Fashion leader and enhance company's image	F	1	1											2
	8	Restores and makes TQM a full system and enhances consistent understanding about TQM to everybody	P	1												1

Category F = Fashion setting, P = Payoffs, S = Strategic fit, O = Organisation fit  
 1 means the interviewee has mentioned or expressed their specific reason and motivation to the adoption

**5.3.7 Effectiveness of CI approaches**

The degree of effectiveness and satisfaction for each programme is rated according to its benefits to the company and employees' participation. From the perception of SCG's senior managers, among TQM, ISO9001, and Quality awards implementation, applying for quality awards is the most effective programme, followed by TQM and ISO9001 respectively. The Business Planning Office manager at Cementhai Distribution said 'Although applying for TQA is so tiring, people perceived its significance and felt good about it' (C1.3).

Question	Quality Improvement Programme	Average	Mode
3) Effectiveness of CI programme	Excellence Self-assessment (Deming prize, TQA)	4.22	4
	TQM (QCC, Suggestion system, 5S)	4.10	4
	ISO9001:2000	4.00	4

5 = Very effective, 4= Effective, 3= Moderate, 2= Not very effective, 1= Not at all effective

SCG hardly measures the cost of implementation since the activities were embedded in the system and daily operations (C1.1, C1.2, C1.4.1, C1.4.2). However, the quantified cost of these initiatives mainly came from the start-up process e.g. training, consultant fees, and promotion. A summary of the cost and time needed to implement TQM, ISO9001, and Quality Awards is found in Table 5.7.

Table 5.7: Cost and time to implement TQM, ISO9001, and Quality Awards

Effectiveness	Business	TQM	ISO9000, ISO14000, ISO17025	Quality Award (Deming Prize, TQA)
<b>Cost</b> (Training and set up investment) [THB]	SCG	Mainly training cost and consultant fee (Japanese specialists)	Administrative cost	<b>7 millions baht/ programme</b> (Japanese consultants' fee, expense to auditor e.g. application fee, examination fee)
	Petrochemical	Training & consultant fee	Assessment, surveillance, re-audit which cost around <b>0.4-0.5 million/ year</b>	1) Consultant fee (Japanese experts for Deming prize are expensive but for TQA, Thai consultant is cheap) e.g. Dr.Kano around <b>0.1 million baht/day</b> , Thai consultant is around <b>10,000 baht/day</b> 2) Man-hours cost and In total many millions/project
	Paper & Packaging	millions baht (at least 1 million baht for suggestion programme, QC activity and training)	n/a	Consultant fee (mostly Japanese experts), is expensive. Hire them to explain the award criteria, how to measure and communicate our practice to match their measurements.
	SRIC	Set up investment in education, training, infrastructure support e.g.IT 1) <b>Consultant fee around 330,000 baht/year</b> includes Dr.Kano 0.15 million/ day (1 time/year), Dr.Ando 90,000 baht/day (2 times/year) 2) <b>Annual cost around 7 million baht</b> includes salary of QM function (9 people) whose salary is 5 millions baht/year, monetary reward, and maintenance cost	<b>1 million baht</b> per year during certificate application. Preparation cost e.g. paper is around 40-50,000 baht	<b>3-5 Millions</b> baht until received Deming prize includes consultant fee, amended site, and a couple of travel expenses to Japan to defend and do audit plan
<b>Cost Range (THB)</b>		<b>7.33 million baht/ year</b>	<b>0.4- 1 million baht/ year</b>	<b>3 - 7 millions baht/ award</b>
<b>Time</b> from start to be fully run/achieve [years]	SCG	12 years	n/a	3 years
	Petrochemical	10 years	2 years	2 years
	Paper & Packaging	10 years	1-2 years	2 years
	Building	10 years	2-3 years	2 years
	Distribution	from nothing so far 3 years	2 years	3 years
	Cement	At least 5 years	1.5-2 years and later around 1 years	2 years
	SRIC	5 years (3-4 years has TQM shape)	1-2 years	2 years
<b>Time Range (year)</b>		<b>10 years</b>	<b>1- 2 years</b>	<b>2-3 years</b>

Compared with all the adopted initiatives, most people agreed that application to the Deming prize consumed the highest cost per project per year (3-7 million THB/ award); but in total, TQM, which is a lengthy programme, incurred the highest implementation cost when considering the cost of man hours lost (7.33 million THB/ year). The investment in time to execute TQM is more than other initiatives with an average of ten years. It takes time to build TQM culture and to get all employees to accept the initiative (C1.2). In 2004 the SRIC Company alone delivered overall cost savings up to 43 million baht (C2.2). Figure 5.5 displays the significance of TQM to the financial performance of SRIC and sales volume of Thai Paper Company (SRIC Deming prize award 2003; TPC Thailand Quality Award 2003).



Figure 5.5: Significance of TQM to SCG performance

The Director of TQPC drew the following conclusions about the significance and outcome of TQM in SCG:

- TQM contributed to the growth and success of SCG.
- TQM strengthened SCG's competitiveness and helped it to survive strongly. The cases of SRIC and Thai Paper have shown that they could survive after the Asian economic crisis because of TQM; see the graph showing SRIC's survival line and Thai Paper crisis management through TQM.
- SCG continued its commitment to and support of TQM although it was faced with severe economic and financial crisis in 1997. In addition, TQM has been maintained in SCG by three generations of top management.
- TQM helps unify and homogenise management practices in the whole of SCG.

### ***5.3.8 Critical success factors and barriers to CI***

'Top management must take it seriously and follow up these activities to make people in the organisation believe that these improvement activities are important and beneficial. The most essential part is that top management must understand the purpose of implementation i.e. understand why-why before how-how.'

(Organisation Development manager of Cementhai Building Products, C1.3)

All eleven quality management managers agreed that even though sometimes TQM is becoming less popular, it never disappears. SCG have had TQM continuously with gradual improvements. The Managing Director of SRIC said:

'sometimes TQM slows down because of 1) the degree of competition and focus change, 2) the characteristics of Thai people, 'who work like a wave' and need motivation, 3) replacement of personnel. Therefore, TQM must be activated and motivated at all times by developing activities all year.' (C1.7)

However, according to eleven interviewees, the most important factor in successful TQM is the SCG leaders, who have constantly shown clear leadership and given high importance to quality management since TQM intensively started in 1992. Similarly, the Director of TQPC said that the key success factor of TQM at SCG is continuous support from all SC Presidents: Mr. Charas Xuto who set up PICC, Mr. Paron Isarasena who introduced TQC and announced the TQC policy, and the current President, Mr. Chumpol Nalamlieng, who has been using and has strongly supported TQM as a management platform (C1.1). Moreover, he added that the role of the top management

must not only be a cheerleader, but the leader must also be a player. The critical success factors of all improvement programmes in SCG can be summarised as below:

- **Top management commitment** (C1.1, C1.3)
- **Employees' attitude.** A common barrier to improvement is employees and their attitude to new initiatives e.g. old thinking, resistance to change, perception that it is a burden. The Production manager at SRIC explained that he tried to create a picture that a new initiative is not another backpack but it's a backpack with wheels that is beneficial and employees can easily pull when necessary (C2.1). 'Adopting any new system, we must incorporate change management starting with building a foundation by training people. It is human nature that without understanding, there is high resistance. Therefore, to lay a foundation, we must start with giving understanding to our people,' (C1.7, C1.3).
- **Communication.** Information must be transparent, clearly show an impact to people around the whole organisation, providing feedback, market information, clear business picture, direction, and the company's situation to everybody in the organisation.
- **Crisis.** 'An organisation can better re-adjust during crisis. There are 2 types of crisis: 1) real crisis for survival, which influences our people to work as a team and 2) Throw-down or Make-up or artificial crisis, which tells them where we want to go e.g. apply for an award' (C2.1).

### 5.3.9 *Drilling down opinions of employees in a Group Company, The Siam Refractory Industry Co., Ltd. (SRIC)*



For triangulation, the author conducted a more detailed study to obtain views from staff in SRIC, one of SCG's best practice companies in TQM. Interviewees were selected by the quality system manager at SRIC to acquire relevant and useful information. The questionnaires were filled in by two different groups. Firstly, twenty-six staff with at least a bachelor's degree (engineers), and secondly fifteen employees with a technical degree (technicians) filled in the questionnaires expressing their understanding and attitude towards TQM and continuous improvement in SRIC. Appendices 20 and 21 display the results of analysis of the questionnaires. From the questionnaires, the most frequently stated continuous improvement activities they currently practise are TQM,

which accounted for 95 percent of all questionnaires followed by ISO9001 (71 percent), and the Deming prize (34 percent). Only one engineer said they did Balanced Scorecard, three engineers said Lean, and two staff added TPM. The Quality System Manager at SRIC stated that TPM has just recently been started, in 2004 (C2.2). Additionally, the most frequently used tools are 5S (93 percent), 7QC tools (90 percent), and SPC (54 percent). Technicians are usually familiar with the basic bottom-up activities and problem-solving tools; while engineers apply a wider selection of techniques such as Lean, TPM, Balanced Scorecard, QFD, DOE, FMEA, 7 Management Tools, Why-Why Analysis, and Daily Management. Figure 5.6 illustrates the frequency of CI activities and quality techniques and tools that are currently practised in SRIC.

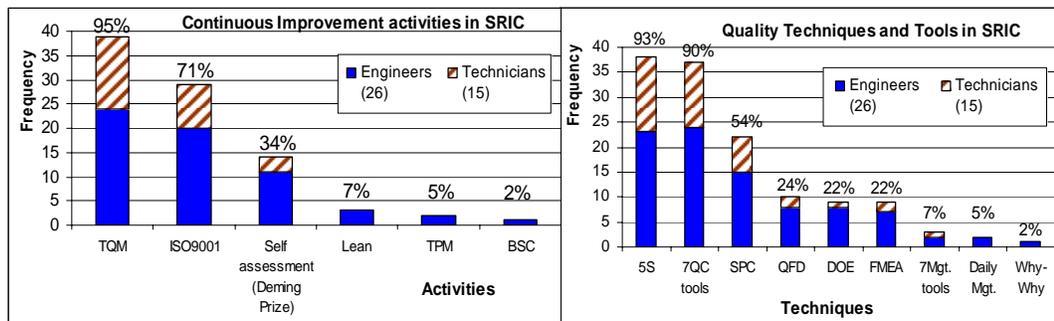


Figure 5.6: CI activities and Quality techniques and tools at SRIC

Continuous improvement activities are normally conducted during regular working time, as mentioned by 66 percent of 41 SRIC employees, and 24 percent said they are carried out during unpaid overtime. None of the activity has been done as paid overtime. Additionally, 39 percent of the interviewees specified that these activities took place during an occasional meeting, whereas 17 percent of the interviewees mentioned that the activities took place in a regular meeting, and 12 percent mentioned that they were carried out in a dedicated CI meeting. The frequency of time and place that QI activity took place and the average time spent on these activities are shown in Figure 5.7.

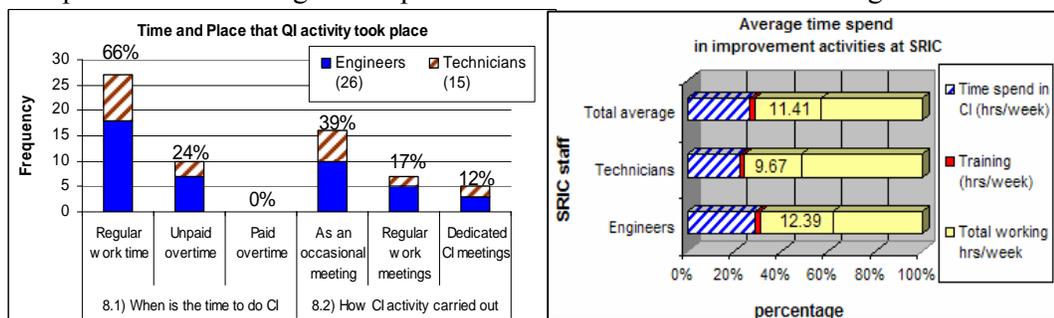
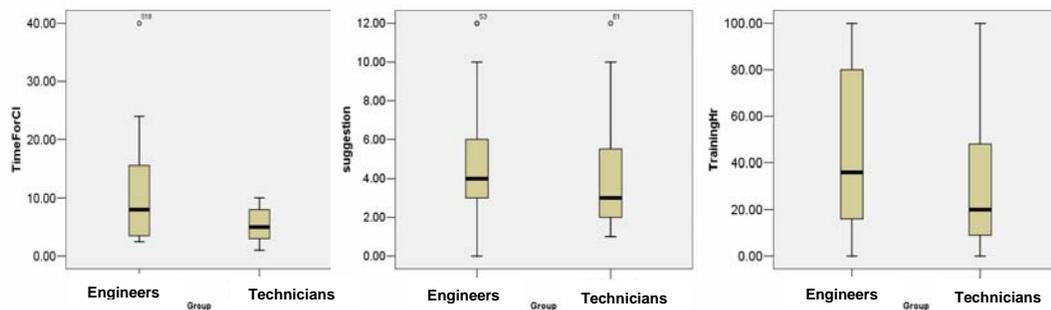


Figure 5.7: Time and Place to conduct CI activities in SRIC

The average time spent on quality improvement activities is around twelve hours per week for engineers and nine hours for technicians. Overall, SRIC people spend on average around eleven and a half hours per week on quality improvement activities plus training or approximately twenty-nine percent of their regular working hours per week (40 hours). Additionally, the average training hours per year is around 40 hours or 1 week with a maximum of 100 hours per year. The average number of suggestions per year is five and maximum is twelve; however, most people suggest around three issues per year. Moreover, there is no statistically significant difference in the average time used for quality improvement activities and training hours, and the number of suggestions per year between engineers and technicians at 95 percent significant level. The distribution of time duration for QI activities per week, and the number of suggestions and training hours per year in SRIC are illustrated in Figure 5.8.



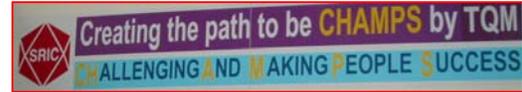
**Figure 5.8: Distribution of the number of hours spent on CI activities per week, and the number of suggestions and training hours per year in SRIC**

Everyone in SRIC supports and agrees upon the company’s continuous improvement activities mainly for the sake of the company’s competitiveness and growth, and customers’ satisfaction. Forty out of forty-one staffs interviewed in SRIC like CI activities. They believe that CI activities will enhance the company’s profit and hence increase their salary and other benefits and rewards. They enjoy participating in these activities as they help develop their skills, and improve their quality of work. Only one person does not like the activities, as one said ‘There is always a limitation in the brainstorming session and we do not have enough time to do CI activities.’ According to the interviews, the factors which help motivate SRIC employees to participate in CI activities can be coded and categorised into four groups as illustrated in Table 5.8.

**Table 5.8: Category of motivation to CI activities in SRIC**

Frequency	Category of motivation to CI activities in SRIC
Majority 	<b>Group 1: Benefits to employee</b> <ul style="list-style-type: none"> <li>▪ 61% [Daily work] Help solving their problems, help them work better, more convenient, easy, fast and more systematic by themselves</li> <li>▪ 32% [Self-improvement] Learn new things, being educated, enhance employees' knowledge, skills and develop their capability</li> <li>▪ 24% [Recognition] Acknowledge their ideas, suggestions, and opinions. Open their opportunity for expression. Stimulate and promote all employees to be part of benefits or bad results of each task since they want to be part of the company's improvement or feeling valued and proud.</li> <li>▪ 5% [Reward] Rewards, bonus, higher salary</li> </ul>
	<b>Group 2: Benefits to the company</b> <ul style="list-style-type: none"> <li>▪ 22% [Operating performance] Increase operating performance e.g. reduce resource usage, increase quality of work, and operations effectiveness</li> <li>▪ 20% [Business result] Enhance company's business results, prosperity, and competitiveness to face fierce competition. Produce good or world-class quality product to satisfy customers. (<i>Implicit benefits to employees through higher salary, bonus or rewards</i>)</li> </ul>
	<b>Group 3: Characteristics of QSHE activities</b> <ul style="list-style-type: none"> <li>▪ 17% [Teamwork] Working in a team and receiving full cooperation from working team</li> <li>▪ 12% [Challenging] Challenging tasks and have new and distinct methods</li> <li>▪ 7% [Good purpose] Aim for good purposes and objectives which are significant to company's survival</li> <li>▪ 5% [Time] Time to do CI activities must not be too excessive to interfere with their regular work</li> </ul>
Minority 	<b>Group 4: Supportive elements</b> <ul style="list-style-type: none"> <li>▪ 5% [Top management support] Support and leadership from managers and top management</li> </ul>

Appendix 20 shows the frequencies of the motivation factors for CI activities, which were expressed by staff and employees in SRIC. The results show that the most frequently stated factors are group one or the activity which has benefited them by improving their daily work, developing self-improvement, giving recognition, and rewards respectively. The second most stated factors are their concern with the company's benefits: operating performance and business results. Lastly, the third and the fourth factors describe the characteristics of favourable CI activity (teamwork, challenging) and top management support.



### 5.3.10 The future for TQM at SCG

Now that SCG has pursued Kaizen or continuous improvement for a number of years, they realise that only incremental improvement by Kaizen is not enough; they need breakthrough and innovation. Many new initiatives have emerged. Some companies in SCG have tried several initiatives and found that without the same understanding in the core framework, it would confuse and ruin the whole system. Hence, the Director of TQPC has sent the message to the whole group that ‘our fundamental approach is TQM and to bring in a new tool, we must carefully look at our concept. If the concept is the same but there are some additions, use TQM as a platform to prevent confusion. Whatever is lacking in TQM, we add in and supplement our TQM’ (C1.1). For example, the Managing Director at SRIC said ‘TQM is a large umbrella. Only when the umbrella is strong, can the company bring in Six Sigma, ISO9001 and BSC as tools under this umbrella’ (C1.7). SRIC’s next action plan to support breakthrough is to have a Change Management Programme. Before breakthrough can happen, the Managing Director at SRIC said ‘we must change people first by creating a core value called SRIC POWER (C1.7). SRIC power stand for S= Speed & Sense of urgency, R = Respect & Reliability, I = Initiation & Innovation, C= Customer delight, P= Pro-activeness & Professional, O= Open mindedness, W= World Class, E = Entrepreneurship, and R = Relationship.’ SRIC believe that it is important to firstly create these mindsets, and attitudes and let their employees change until they feel ownership. All of these will support breakthrough creation.

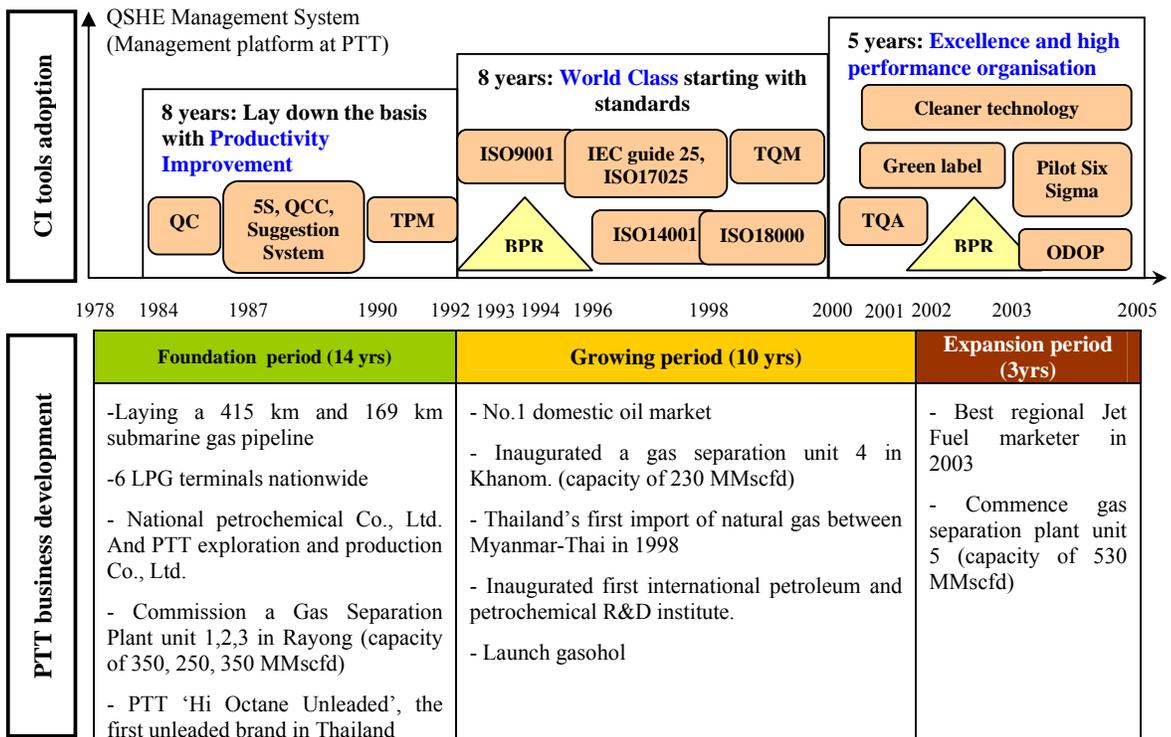
## 5.4 CASE B: PTT



Following PTT’s vision to become a High Performance Organisation and a regional leader in the oil and gas business, Quality Safety Health and Environment (QSHE) is a core management element of PTT’s business. Every unit and all areas must follow QSHE policy as well as all initiated programmes from the QSHE management department (PTT 2006a). The QSHE management department has a responsibility to ensure, promote, support and disseminate the quality, safety, health, and environment policy and goals in PTT.

**5.4.1 The development of QSHE management at PTT**

Continuous Improvement activities at PTT have been implemented for more than 20 years under the QSHE management. Mr. Viset Choopiban, a former President of PTT during 2001-2003, said that the success of the PTT business came from customer confidence in PTT’s products and services, which is partly due to the QSHE management system (PTT 2002). The development of QSHE at PTT can be described by a number of adopted CI tools grouped under three different visions from top executives. The QSHE manager at the gas unit explained that it is the top executives who create vision and bring in new tools every year (P2.2). There are three phases of QSHE management development in PTT: Phase 1: Lay the basis with Productivity Improvement, Phase 2: Go World Class starting with internationally recognised standards and Phase 3: Become Excellent with innovation. The path of CI activities at PTT and its business evolution based on interviews with the VP of QSHE and the QSHE manager at the gas unit (P1.1, P2.2) and the company’s documents (PTT 2006; PTT 2003a; b) are triangulated and illustrated in Figure 5.9.



**Figure 5.9: Process of CI adoption and PTT business development**

It is the PTT executives who created a vision and hence the initiatives were adopted with the intention of satisfying organisational aims. The CI route at PTT began with QC activities in 1984, followed by three sets of 5S, QCC, and suggestion system-basic TQM activities in 1987, and Total Productive Maintenance in 1990 to lay down the basis by bringing new tools for productivity improvement (P2.2, Palang Thai for Thai 2003). After eight years aiming for productivity improvement, the second generation of PTT executives wished to go for being a World Class Organisation and hence PTT brought in internationally recognised standards and implemented almost all ISO systems including ISO9001, ISO14000, ISO18000, IEC guide 25, and now ISO17025 for lab (P1.1, P2.2). PTT at present has around 70-80 ISO certifications (P1.1). After fulfilling the basic level, the third phase is to reach even higher by aiming for excellence through innovation and a pilot project of the TQA system started at the gas business (P2.2). During the CI development, PTT did BPR twice in 1993 and 2002 implementing the ERP system.

In the past five years, the gas business has been the leader in terms of quality and CI; it has received Thailand Quality Class, implemented TPM and started piloting the Six Sigma programme in 2003 (P1.1). The QSHE manager at the oil unit explained that there is a limitation to the adoption of CI tools in the oil business because employees in the oil unit are a mixture of previous government officers (old) with less capability to run the business and new recruits; hence it is more difficult to introduce new techniques than in the gas business, which is full of new employees (P2.2).

#### 5.4.2 *Quality Safety Health and Environment management at PTT*

The philosophy of QSHE management is to regulate Safety, Health, and the Environment as a must for business operation continuity and Quality is a preference for the organisational competitive advantage as illustrated in Figure 5.10. The EVP corporate HR said ‘PTT is an energy business which has an impact on society and the environment; therefore, SHE is compulsory for us’ (P1.3). The QSHE management department is responsible for promoting, supporting, and stimulating all QSHE related activities.

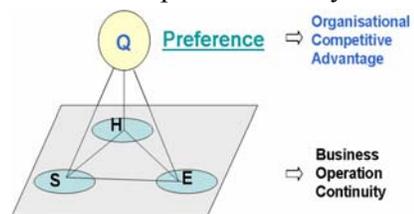


Figure 5.10: QSHE management philosophy

Unlike some companies in SCG which have different names or positions responsible for QM and CI, PTT has explicit and coherent names and positions accountable to QSHE management. PTT’s QSHE management organisational structure is shown in Appendix 22 (PTT 2003b). The QSHE department has the responsibility to support QSHE activities especially in training. QSHE steering committees or QSHE corporate positions are composed of 6 people. They are the key decision-makers who decide which QSHE management tools to adopt and to what extent, and then propose them to the PTT steering committees at corporate level for final approval and announcement as QSHE policy. The QSHE steering meetings are conducted every two months (7-9 times/year) and report the progress to the PTT steering committee every quarter. Before the end of each year, they have a workshop to summarise QSHE future activities (P1.1). QSHE policy at the corporate level, which is revised once every four years, is a base and a minimum practice that everyone must follow. The annual target of each BU is a detailed policy, which may have extra activities to fit with their specific focus. It is formulated by the QSHE supported staff. For the gas unit, there are 17 policy and roadmap creators in total (6 from QSHE gas, 6 from Safety and Environment in gas separation, and 5 from Safety and Environment in gas distribution). The formulation of QSHE policy is depicted in Figure 5.11.

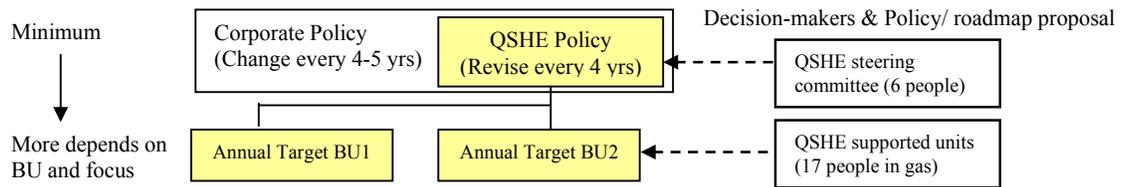


Figure 5.11: QSHE policy

**5.4.3 Importance and triggers of QM and CI at PTT**

According to the Executive Vice President of Corporate Strategy, the main triggers for the implementation of QM and CI at PTT are the desire to increase the company’s competitive advantage in the area of cost and productivity improvement (P1.2). Figure 5.12 illustrates the strategy of PTT competitive advantage and triggers to the area of QM and CI. From the corporate strategy point of view, both innovation (top gear wheel) and incremental improvements (bottom gear wheel) are the mechanism to leverage the competitive strength of PTT. The bottom wheel represents the best practice platform

where an employee works e.g. IT, HR system; while people must have commitment to delivery. Both wheels need to drive together for excellent value. To acquire the competitive advantage, revenue must increase by using good strategy to stretch and leap up, e.g. growth by acquiring other businesses, innovation, or finding strategic partners. Moreover, cost must decline by employing the productivity tools. The area of QM and CI is concentrated on the lower graph of cost where productivity is the goal as highlighted in Figure 5.12. In the area of QM and CI, QSHE vision has stepped up and widened from productivity improvement, to world class, and at present it aims for PTT to be a High Performance Organisation.

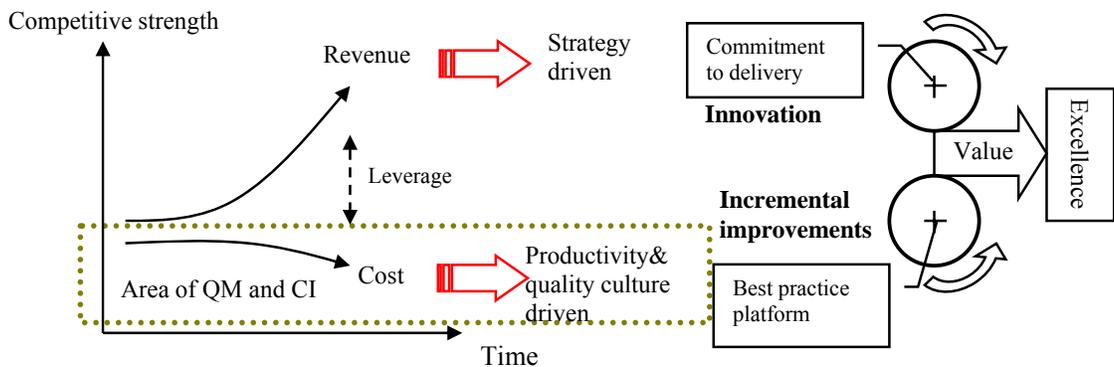


Figure 5.12: Competitive advantage as triggers to QM and CI in PTT

**5.4.4 The approaches adopted overall**

Almost all quality and CI programmes have been adopted in PTT. The VP of QSHE said ‘PTT is quite fast in receiving new technology through visions of PTT’s corporate level’ (P1.1). The QSHE manager at the gas unit supported this, commenting that top executives in the gas unit like to bring in new tools every year and when no new tool comes employees would feel irritated. He said ‘Although when we use new tools, employees complain because their workload increases but CI works’ (P2.2). Until now PTT has still sustained all the adopted tools, although their emphases have been varied over time and some old initiatives have slowed down. The VP QSHE described that:

‘Ten years ago, our CI tools were not as advanced and complicated as today. Previously, we emphasised individual productivity tools and then the ISO series came. We implemented several ISO series including ISO9001, ISO14001, ISO18000, and ISO17025 for lab throughout the PTT organisation until ISO became our foundation which seems to replace the old tools. QC, mini QC, and the suggestion system which have been done for more than ten years seem inactive and tend to slow down, similar to the

declined trends in Thailand and the world. However, we did not throw away the previous tools.’ (C1.1)

In 2005 the core programmes which the Corporate Policy announced that all people in 60-70 departments at PTT must follow were 5S, Suggestion System, QC/mini QC, ISO standard, TPM, and the recent ODOP activity. ODOP is a new initiative created by the QSHE team which means that One Department must create and implement One Project for improvement. Although 5S has been practised in PTT for more than 20 years, it is still fundamental as QSHE management continue to develop, improve, support, and it is also stated in every year’s QSHE objective and policy that all staff in every unit and every area must do 5S (P1.1). The importance and sustainability of 5S activity at PTT is also supported by the survey of PTT research and technology (2003) as 5S activity received the most participation in PTT overall with 99.3 percent, and has the highest perceived benefits of neat and clean workplace to 26.7 percent among 428 employees.

Without an explicit and well-explained TQM management framework or ‘house of TQM’ like SCG in Figure 5.4, each of PTT’s tools is practised as a separate programme with their goals to fulfil the QSHE policy. PTT’s QSHE annual target is the determinant to its sustainability and dictates the intensity of the programme. Many old and new tools continued and were announced in the QSHE 2004 annual target. The problem of *‘initiatives overload’* has arisen. The QSHE Management Division Manager said

‘Without clear linkage among all tools and communication to employees, PTT adopt all new and fashionable ideas initiated by foreigners. We have failed to find what is appropriate to our employees, which has confused the implementers. Frequently changing the name of new programmes discourages employees’ morale and results in discontinuing the activities.’ (P2.1)

The consequences of overloaded initiatives in PTT occurred as follows:

- Employees started to **complain** or feel annoyed as supported by 50 percent of PTT employees’ survey (PTT research and technology, 2003) and interviews with 20 employees for this research.
- Old tools have reached **saturation**. The VP of QSHE explained that ‘At the beginning quality policy defined the target as a minimum of one suggestion per person per year and each division must do one QC project. However, now we have found that we have done these activities for a long time and people could not think of this project any more so now we no longer set a target’ (P1.1).

- Old tools have improved and become more **complicated**, such as the suggestion project in the gas business is counted when employees suggest an improvement and fully implement it; whereas before an employee can suggest improvement of other functions.
- **Promotion for old tools slows down.** The QSHE policy manager said ‘When we first started the programme, top management paid more attention, put in more effort and more promotion. Later there were too many activities e.g. 5S, suggestion, QC, ISO, safety and each of them required a lot of paper work. We thought our people must be familiar with the old tools, which should be embedded in their hearts, so we reduced the promotion. When the promotion decreased, the activity halted’ (P1.4).

#### *5.4.5 The reasons for 5S, QC, suggestion system, ISO9001, and other initiatives*

Interviews with top management who formulate corporate policy, QSHE policy and QSHE target at the gas and oil units in PTT reveal the reasons for PTT’s choice to pursue the Japanese 5S, QC/mini QC, suggestion system, TPM, the ISO certification, and quality awards. Overall the most important reasons for the adoption of improvement ideas are especially to improve productivity and others such as the company’s competitiveness, product/service quality, and process/working system, enhancing customer satisfaction, increasing quality awareness and for employee development. Appendix 23 illustrates the ranking from interviews. According to the perception of EVP corporate HR, it is the benefit of productivity improvement that matters, although some activities have less value than others (P1.3). Most interviewees deny fashion as their criteria for the adoption. However, many agreed that adopting fashionable programmes has a positive impact on the company’s reputation, which is one measure for Corporate Governance. The QSHE manager at the oil unit said ‘Corporate governance must have a transparent business and standard, and be responsible to society; therefore, we take this into consideration that the selected tools will be presented to the public’ (P2.3).

From the point of view of corporate strategy, these improvement activities are the mechanism to enhance PTT’s system and culture. EVP corporate strategy explained that

PTT drives organisation by two components: system driven and culture driven. Improvement programmes in PTT were used to change Thai culture to a quality culture e.g. 5S, suggestion, and QCC, and to improve weaknesses in the system considering process, technique, and people e.g. reengineering (P1.2). Characteristics of Thai people and reasons for implementing improvement programmes are described (P1.2, P1.3, P2.3) and summarised in Table 5.9. Many of them cohere with the comments from the SCG case.

**Table 5.9: Thai characteristics and reasons for improvement activities**

Thai characteristics and culture	Why improvement activities?
Dislike creative thinking as observed from employee’s suggestions which are not good.	- Suggestion system helps maintain creative thinking.
Submissive	- QCC activity encourages people to think and participate.
Thai people like a happy and comfortable life. Therefore, Thai people do not like system and regulation.	- 5S is the beginning and basic tools to set the regulation of work e.g. put all files in order and have a system. 5S improves Thai culture. - Without a good system, our industry could not grow. Developing a system is fundamental e.g. ISO system. - System works by itself which avoids people conflict.

**a. Why 5S, QC/mini QC, Suggestion System, and TPM: productivity improvement, and quality culture?**

The purpose of adopting 5S, QC/mini QC, and the suggestion system in PTT is for productivity improvement to deliver cost reductions and build a quality culture. In the early 90s, these were the only productivity improvement tools available in Thailand. The PTT governor during that time had a belief in these tools, especially 5S, and pushed these activities forward (P1.2, P1.3). PTT started with these three initiatives from Japan because they were easy to implement and they were a supplement to working life, and later these activities become a foundation for QSHE (P1.3, P2.2). The VP of QSHE recalled that

‘5S was the first initiative from Japan which PTT adopted because we perceived that it should be beneficial to our organisation [pay-offs] and should be easy to implement throughout the whole organisation [organisation fit]. We did not hire a consultant but we studied companies which already had these tools e.g. Cement Thai, which hired Japanese consultants [fashion setting].’ (P1.1)

EVP corporate strategy said ‘Truly these activities were implemented to change our culture. 5S helps to improve our culture most. It makes sure our operations are neat and clean, provides a clear working area, and reduces accidents’ (P1.2). In addition to

productivity improvement, in PTT these three programmes have been used to develop people towards the culture of quality and continuous improvement. The QSHE manager at the gas unit explained that ‘QCC and the suggestion system are used to develop people and establish the habit of thinking to improve productivity. 5S is a foundation, QCC is a problem-solving tool, and the suggestion system is like innovation’ (P2.2). Total Productive Maintenance (TPM) is another productivity tool which is directly related to machines. The QSHE manager at the gas unit said ‘We copied TPM from Japan. Our business expanded so we have many new employees and TPM has been implemented to help develop our people’ (P2.2).

**b. Why ISO series: foundation and recognition as World Class?**

It was the PTT executive who had a vision to go for World Class, and hence the ISO systems were embraced throughout PTT as an international standard (P2.2, P2.3). EVP of corporate strategy explained the reason for ISO series adoption in PTT as a foundation for a good system, which is a base to leap over to TQA (P1.2). He explained that unlike a new private company, PTT is a hybrid company, which was founded by merging two Thai government units (Department of Fuel and Natural Gas) and composed of a number of employees who graduated abroad. Therefore, the ISO series was expected to help build a systematic and a referential system. The VP of QSHE also added that ISO is a system with certification and is involved with international standards (P1.1). Hence, during the past 5 years, PTT has used ISO systems as its main CI tools for the purpose of a basic foundation with international recognition.

**c. Why Thailand Quality Award, BPR, Six Sigma, and other new ideas: a fashion adopter?**

Thailand Quality Award, BPR, Benchmarking, Six Sigma, and others are some initiatives which are not stated in the PTT corporate policy but QSHE management only gave lukewarm support for their employees’ learning of the programmes. These programmes were either adopted in some of PTT’s business units e.g. TQA, Six Sigma or only implemented throughout PTT for a short period of time e.g. BPR. A high trend in Six Sigma and TQA application in Thailand introduced by the Thailand Productivity Institute (fashion setting) was the first motivation for PTT to follow. However, major concerns about the adoption were the feasibility for implementation, the readiness of the company (organisation fit), and the acquired benefits (pay-offs). The VP of QSHE said

‘The reason for PTT to apply for the TQA was because it was a new tool; however, our final decision point was that it does not require implementing throughout the whole organisation and only a ready section and small unit can apply, which seems feasible, flexible and faster’ (P1.1). Benchmarking is another additional tool which is used in the planning and strategy unit and in the section that applied for TQA, as benchmarking is one of the TQA requirements (P1.1). The EVP of corporate HR confirmed that the gas separation plant has an sufficient capability to apply for TQA, including the ability to change, management team, investment, and competitiveness but not yet for the whole QSHE system. Now that PTT has got TQC, TQA will be next, and the future will be the Deming prize (P1.3). From the corporate strategy point of view, implementing TQA matches PTT’s strategic focus on commitment to delivery (strategic fit), which is measured by results. Moreover, TQA is measurable and referential to the Malcolm Baldrige award; hence the TQA score can be used to compare PTT with other companies in Singapore and the United States and reveal the company’s position (P1.2).

For BPR, it was the arrival of Information Technology and the boom of reengineering in Thailand (fashion setting) which then became the organisation’s strategy (strategic fit) as the VP of QSHE, the QSHE policy manager and the QSHE manager at the gas unit (2005) recalled. PTT hired consultants to implement reengineering as a project type in various processes, which helps to reduce people and repetitive working processes (pay-offs) (P1.1, P2.2). The QSHE policy manager said ‘Once the BPR trend bust, we dropped it and the promotion declined’ (P1.4). EVP of corporate strategy said ‘We continuously reduce our headcount, although it is limited to a certain number. It depends on the situation whether or not to restructure our organisation to fit our work at that time. Lately we changed from ORACLE to SAP system’ (P1.2).

In summary, although there are several reasons for the adoption of each CI initiative, all of them fall into the four categories of fashion setting, pay-offs, strategic fit, and organisation fit as listed in Table 5.10. 5S, QCC, and suggestion systems still continue their implementation mostly due to constant announcements in the corporate policy and QSHE annual target (strategic fit) and these activities are perceived as beneficial and supplementary to Thai working life (pay-offs). Similarly in the case of ISO systems and BPR, clear and steady demand from the corporate policy and their associated benefits are heavy considerations in favour of the adoption of these two programmes. The most

frequently perceived benefits and motivations to execute ISO systems in PTT are its internationally recognised standard with certification and its foundation to build a systematic way of working. For BPR, it is the benefits of reducing headcount and repetitive working processes. PTT decided to apply for TQA in the gas unit mostly because it is a new and trendy tool promoted by the Thailand Productivity Institute (fashion setting), it is measurable and comparable to the scoring of the Malcolm Baldrige Award (pay-offs), and a ready and capable unit can apply, not requiring the whole organisation (organisation fit).

**Table 5.10: Summary of reasons for the adoption of CI initiatives in PTT**

The adopted initiatives	no.	Specific reasons and motivation	Category	References (Interviewees)							Sum
				P1.1	P1.2	P1.3	P1.4	P2.1	P2.2	P2.3	
5S, QCC, Suggestion system, TPM	1	Beneficial and supplementary to working life	P	1		1	1		1	1	5
	2	Corporate policy to improve productivity and QSHE annual target	S/P	1		1	1	1	1		5
	3	Foundation for QSHE	P/O	1	1	1			1		4
	4	Easy to implement throughout the whole organisation	O	1		1	1				3
	5	Change Thai culture, develop people, and establish the habit of thinking	P		1				1	1	3
	6	Study from SCG who had these programmes from Japanese consultant	F	1							1
ISO9001 and other ISO certification	1	System with certification and internationally recognised standard	P	1					1	1	3
	2	Foundation for systematic work with reference	P	1	1				1		3
	3	Top executive vision for World Class	S			1			1	1	3
	4	Direct contact to customer	P				1				1
BPR	1	Reducing headcount and repetitive working processes	P	1	1				1	1	4
	2	Corporate strategy and policy to implement reengineering	S	1	1		1			1	4
	3	IT booms	F	1			1		1		3
Six Sigma	1	Higher step to ISO9000 with lower defects rate	P		1						1
	2	New tools and introduced by Thailand Productivity Institute	F	1	1						2
Quality Awards (Thailand Quality Award)	1	Have capability i.e.the ability to change, management team, investment, and competitiveness	O	1		1					2
	2	It is measurable and comparable. This award imitate the Malcom Baldrige Award. It can reveal where the company are.	P		1	1					2
	3	Top executive suggested implementing TQA	S					1			1
	4	Align with the company's strategic focus of commitment to delivery	S		1						1
	5										

Category F = Fashion setting, P = Payoffs, S = Strategic fit, O = Organisation fit  
 1 means the interviewee has mentioned or expressed their specific reason and motivation for the adoption

**5.4.6 Effectiveness of CI approaches**

The effectiveness of CI in PTT can be judged by the sustainability of QSHE activities and how far it is absorbed into employees’ lifeblood (P1.1, P2.2). Perceptions from seven top management and QSHE managers at PTT revealed that among TQM, ISO9001, and Quality awards implementation, the ISO9001 system is the most effective programme, followed by the activities of Suggestion system, 5S and QCC; applying for the Quality Award of TQA between ‘not very effective’ and ‘moderate’. Their rating scores are shown below.

Question	Quality Improvement Programme	Average	Mode
3) Effectiveness of CI programme	ISO9001:2000	4.20	4
	TQM (QCC, Suggestion system, 5S)	3.83	4
	Suggestion System	4.00	4
	5S	4.00	4
	QCC	3.50	3
	BPR	4.00	3
	Benchmarking	3.00	3
	Excellence Self-assessment (TQA)	2.00	3

5 = Very effective, 4= Effective, 3= Moderate, 2= Not very effective, 1= Not at all effective

PTT did not track the implementation cost of these activities; however, the amount of cost savings represents their success. In 2003 the PTT gas unit delivered overall savings of up to 250 million baht, of which 80 million baht came from the suggestion system alone (P2.2). The time to implement the three basic activities of 5S, QCC, and the suggestion system was approximately 5-10 years followed by the application to TQA of 5 years, 1 year for each ISO certification, and 0.5 to 1 year for the BPR project, as summarised in Table 5.11.

**Table 5.11: Time to implement CI activities in PTT**

PTT	5S, QCC, and Suggestion system	ISO9001, ISO14001, IEC guide 25, ISO17025, ISO18000	Quality Award (TQA)	BPR
	10 years	1 year for a certification	5 years in total	0.5-1 year
<b>Time from start to be fully run/ achieve (years)</b>	<i>Lay down the basics in productivity improvement and working life to every employee. 5S needs at least 3-5 years to be instilled into people until it becomes their habit.</i>	and 5 years certified all ISO systems throughout organisation approximately 70-80 certifications in 2005	<i>(including 2 years study and 3 years to apply and receive TQC award)</i>	<i>(implemented as project so it cannot be long)</i>
<b>Time Range (year)</b>	<b>5-10 years</b>	<b>1 year</b>	<b>5 years</b>	<b>0.5-1 year</b>

**5.4.7 Critical success factors and barriers to CI**

‘To sustain continuous improvement, all activities must be absorbed into the employees’ lifeblood. However, all products have a life-time; hence the QSHE department must always keep stimulating and announcing regularly through reward and regulation.’

(VP QSHE, P1.1)

The critical success factors and barriers to CI at PTT as supported from all interviews are composed of:

- **Top management commitment.** All interviewees agreed on strong top management belief and emphasis as a critical success factor. The QSHE manager at the gas unit said ‘The problem in CI is in the top executive at each business. Once the top executive in the area does not emphasise that we need to improve continuously, then CI is at an end’ (P2.2).
- **Employees’ attitudes towards CI.** The EVP of corporate HR said ‘people in the organisation are the main barriers to improvement. Everybody must believe that the concept is good which reduces the resistance. A good leader must show the

successful outcome or benefits from implementation which will then increase employee collaboration' (P1.3).

- **Rewards and recognition.** Rewards and recognition are communal and tangible benefits, which are a catalyst to improvement (P1.3).
- **Speed of change.** The EVP of corporate HR said 'PTT is a state enterprise; hence all changes occurred slowly so we cannot catch up with Western companies' (P1.3).

#### *5.4.8 Drilling down- opinions of employees*

For triangulation, the author conducted a more detailed study to obtain views from staff in the gas unit, oil unit and main office. All interviewees were selected by the author and the corporate QSHE management team to acquire representative staff and receive relevant and useful information. A total of twenty staff who directly deploy QSHE activities (7 TQA team members from the gas unit, ten QSHE employees at the lubricant oil unit, and 3 employees from head office) were individually interviewed and filled in the questionnaire about their understanding and attitude towards QSHE programmes in PTT. Appendices 24 and 25 display the results of analysis of the questionnaires. Figure 5.13 illustrates the frequency of QSHE activities and quality techniques and tools that are currently practised in PTT based on the number of employees who mentioned them in the interviews. The most cited QSHE activities in PTT overall are TQM and the ISO system (95 percent), TQA (45 percent), TPM (35 percent), and 25 percent mentioned BPR and Six Sigma (solely employees in the gas unit). For quality techniques, all interviewees said they employ 5S, 90 percent mentioned 7QC tools, 75 percent SPC and control chart, and 70 percent process mapping. Other tools such as 7 management tools, DOE, advance process control, FMEA, and QFD are occasionally used in the gas unit and a few of them are applied in the office.

Answers from the employees agree with the interviews with PTT top management. The gas unit is the fastest in receiving new approaches based on the number of activities and tools practised. Also interviews with employees show that within the same organisation of PTT the adopted initiatives can be varied, as can the concentration on each activity. For example, employees in the gas unit are more familiar with TQM, the ISO system, TQA, and Six Sigma; while in the oil unit people are more familiar with the ISO

system, TQM and TPM. In addition, a wide variety of techniques are employed in the gas business but not others.

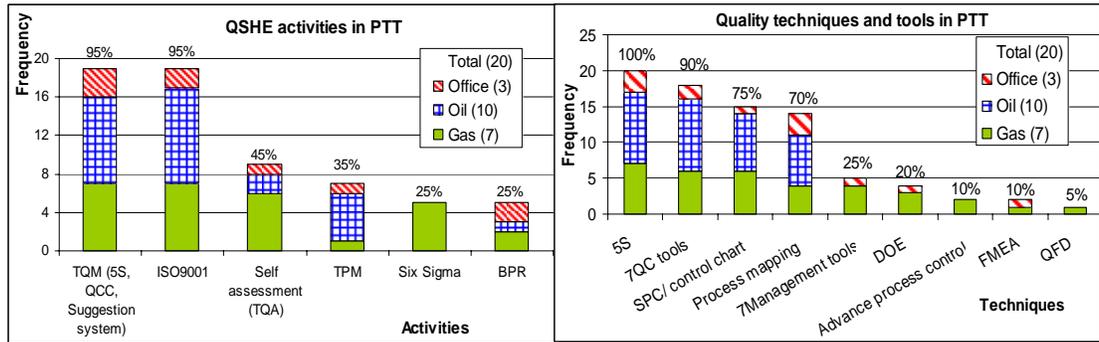


Figure 5.13: QSHE activities and quality tools in PTT

**The time and place to conduct QSHE activities are displayed in**

Figure 5.14. QSHE activities are usually implemented during regular working hours, as said by 95 percent of the interviewees; while 30 percent of them do it in overtime without extra payment and 5 percent in paid overtime. However, ways to conduct them can be varied. Employees in the oil unit manage them in regular meetings and occasional meetings; while people in the gas unit frequently work in dedicated meetings. An occasional meeting was mainly held in the office unit and sometimes in the oil business, as cited by a total of 50 percent of them. Overall, PTT employees spend an average of around twenty-seven hours per week on QSHE activities plus training or approximately sixty-eight percent of their regular working hours per week (40 hours). This is similar to the statement from the QSHE top management team that they attempt to instill QSHE activities into their people’s lifeblood as many PTT employees said QSHE activities are practised in their daily work. Both the total average training hours and time spent on QSHE activities of PTT (80 hrs/year, 26 hrs/week) are higher than in the case of SCG (40 hrs/year, 11 hrs/week). This is due to a higher number of adopted initiatives in PTT which consume more time dedicated to these activities and training.

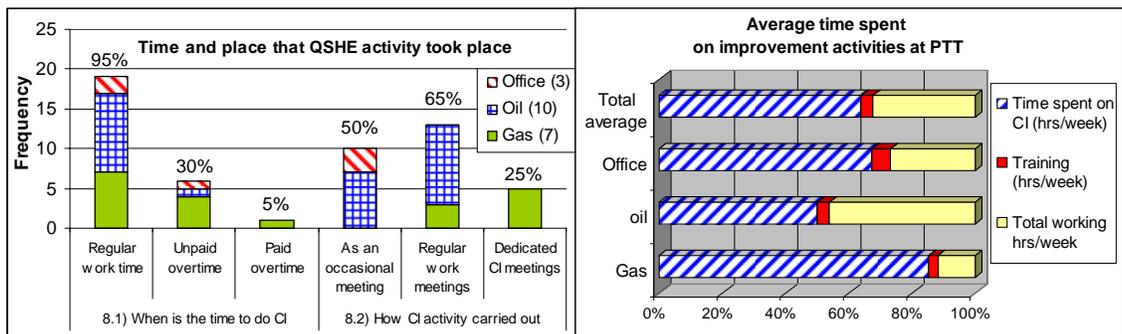


Figure 5.14: Time and place to conduct QSHE activities

All interviews with PTT employees in the office (3 people), the gas unit (7 TQA team members) and the oil unit (10 employees) perceived and agreed upon the significance of the company’s continuous improvement activities. Their reasons are for company’s competitiveness, customers’ satisfaction, better and more systematic working standards, and enhanced problem-solving skills. However, a number of them complained that there are too many and duplicated programmes with several measures, and complicated documentation, which increases their workloads. This problem of ‘initiatives overload’ is consistent with the previous survey from PTT research and technology (2003), which suggested that QSHE should limit numbers of current activities to an appropriate level and reduce the duplicated ones. The Head of the QC division in the lubricant oil unit said lately people feel happier due to the integration of the auditing process among several systems such as TPM with 5S and ISO systems. Still many employees neither like QSHE programmes nor dislike it. According to the interviews, the factors which help motivate PTT people to participate in QSHE activities are coded and categorised into four groups as illustrated in Table 5.12.

**Table 5.12: Category of motivation to participate in QSHE activities in PTT**

Frequency	Category of motivation to QSHE activities in PTT
Majority 	<b>Group 1: Benefits to employee</b> <ul style="list-style-type: none"> <li>▪ 65% [Daily work] Help solving their problems, help them work better, smoothly, more convenient, easy, fast, have more systematic work, and achieve work target. It is part of their work life.</li> <li>▪ 40% [Recognition] Open up their opportunity for expression, acknowledge their ideas and participate in problem solving. Employees feel proud of being part of the company’s improvements.</li> <li>▪ 30% [Self-improvement] Opportunity to learn new things, be educated, enhance employees’ knowledge, skills and develop their capability.</li> <li>▪ 20% [Work promotion] work promotion, create working opportunity</li> </ul>
	<b>Group 2: Benefits to the company</b> <ul style="list-style-type: none"> <li>▪ 50% [Business’s results] Enhance business results, prosperity, competitiveness, and company’s image. Employees perceive the benefits to business survival and sustainable growth.</li> <li>▪ 20% [Operating performance] Increase operating performance e.g. reduce cost, increase quality of work, and productivity</li> </ul>
	<b>Group 3: Characteristics of QSHE activities</b> <ul style="list-style-type: none"> <li>▪ 35% [Teamwork] Working in a team and receiving full cooperation from working team; stimulate one another to continual improvement.</li> <li>▪ 20% [Integration of similar activities] Integration among similar systems to reduce the duplication e.g. integrating audit process of TPM and 5S program.</li> <li>▪ 25% [Frequent announcement] frequent announcement about the activities to stimulate awareness.</li> <li>▪ 5% [Challenging] Challenging tasks and has new techniques to try.</li> </ul>

<b>Minority</b>	<p><b>Group 4: Supportive elements</b></p> <ul style="list-style-type: none"> <li>▪ 30% [Top management support] Support and leadership from managers and top management. Support top management's policy.</li> <li>▪ 5% [Budget] Budget provides for the activities</li> </ul>
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Appendix 24 shows the frequencies of the motivation factors for QSHE activities. Similar to the case of SCG, the frequently stated factors are the benefits gained from implementing the QSHE programme which has an impact first on the employee, and then the company (group 1 and 2) followed by the programmes' characteristics of working in teams and good support from top management (group 3 and 4). More than twenty percent of the interviewees said QSHE management should integrate similar activities to avoid duplication e.g. audit process, and frequently announce the deployment of these activities throughout PTT to activate the programmes. Nevertheless, many employees in PTT commented that giving rewards and gift prizes are not the main motivation for their enjoyment and participation in QSHE programmes but instead that good results and benefits to the company are essential. A quality control employee at the lubricant oil unit said 'With no good results, providing a prize cannot motivate my participation.' An employee at the travel service department in the office also said 'QSHE promoters always give away many small gifts such as pens, rubbers, and so on. Excessive and unnecessary gifts cannot stimulate employees. On the contrary it reduces our motivation since good products or activities do not need to give any gift. Instead QSHE should push to enhance good employee awareness of these activities.'

#### **5.4.9 The future for QSHE at PTT**

The future direction of QSHE management and which approaches PTT will adopt are designed and created in corporate QSHE policy by the QSHE top management team. The VP of QSHE said 'The direction of QSHE still remains the same. The QSHE team continues to promote, support, and stimulate all our QSHE activities so that it can be absorbed into our people's lifeblood and become sustainable. A systematic HR development system is what we want, which should be linked and integrated into CI activities,' (P1.1). One Department One Program (ODOP), a new focus and PTT's own creation, is a recent policy for all departmental managers in around 60-70 departments to create and finish one improvement project per unit.

In addition to top-down corporate QSHE policy, a specific QSHE roadmap for each PTT business unit is created by QSHE managers. For the gas unit, the leading company in QSHE activity, their strategic roadmap to becoming a High Performance Organisation (HPO) and World Class is implementing TPM at the Rayong gas separation plant in 2004, applying for the Excellent TPM prize in 2006 and the Thailand Quality Award in 2007 and 2009 for the whole gas unit. The QSHE managers at the gas unit said ‘all strategic roadmaps should be approved by top management and the adopted activities must show their linkage to HPO and gain support from top management; otherwise we will be trying for nothing’ (P2.2). In the oil unit, complying with all ISO systems is still their main priority followed by 5S, the suggestion system, QCC and ODOP, a new highlight.

## 5.5 CASE C: JOHNSON & JOHNSON THAILAND



Under the global strategic direction of the Johnson & Johnson Credo, Johnson & Johnson Company has continuously improved its business with an aim to fulfil its committed responsibilities to customers, employees, community, and stockholders. In contrast with SCG and PTT, JJTH has two dedicated departments responsible for quality and continuous improvement. One is the Quality and Technique Assurance (QTA) department which is responsible for the quality and compliance of the product, process, and system. The other is the engineering department which is accountable for operational improvements. According to the QTA director, ‘JJTH gives high importance to quality in response to the Credo guidelines and this is confirmed by leaders possessing clear responsibilities and a permanent position in quality and compliance at the corporate level’ (J1.3). The engineering department holds a major role in adopting, initiating, and deploying a number of improvement programmes in JJTH especially for the Process Excellence deployment.

### 5.5.1 *The development of QM and Process Excellence at JJTH*

Like many organisations, J&J has gone through the quality journey and implemented a number of quality improvement approaches. The development of JJTH and the J&J quality journey as chronologically described by the adoption of QM approaches

beginning from quality institute to today’s process excellence is illustrated in Figure 5.15.

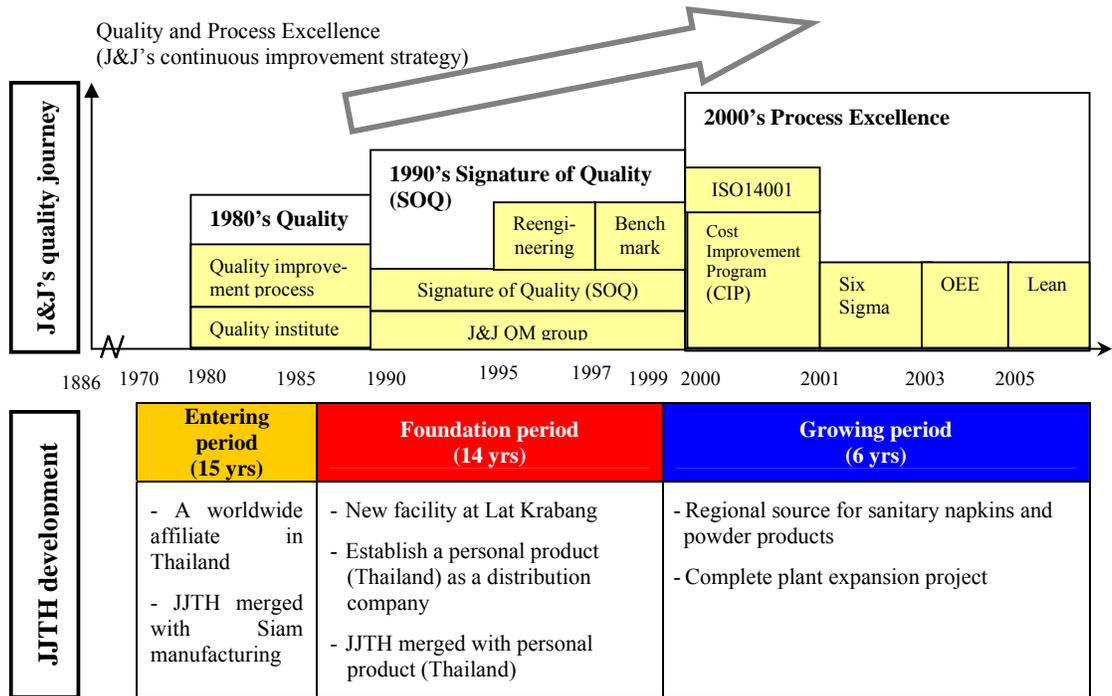


Figure 5.15: Quality and continuous improvement journey and JJTH business development

Susan Lemons, a former Vice President of process excellence in J&J, described the J&J quality journey in three phases: 1980’s, 1990’s, and 2000’s:

‘In the 1980s, J&J brought a formal improvement process (QIP) and the quality institute. In the 1990s, J&J implemented Signature of Quality (SOQ), a J&J quality awards program that resembled the Malcolm Baldrige program, and started the J&J Quality Management group. J&J started Process Excellence (PE) in 1999.’ (Best practices 2003)

Moreover, J&J reengineered in 1995 and benchmarked throughout 200 J&J operating units in 1997 (Pzekop 2006). The results from reengineering and benchmarking found best practices and common improvement methodologies which then formed the foundation of PE at J&J (Best Practices 2003; Pzekop 2006). The J&J corporate quality journey and the implementation of quality programmes in JJTH are similar; although there is some time lag in the adoption and some differences in the sequence of activities. Due to the J&J decentralised management, the deployed roadmap and the sequence of PE implementation are designed by the senior management team at the Thailand plant. From the interviews with senior managers in JJTH, the timeline for the adoption of

quality programmes in JJTH is approximately two years behind its corporate policy (i.e. J&J launched PE in the US in 1999, the initiative went global in 2000, and JJTH started PE deployment with the Six Sigma education in 2001). Under the PE implementation, four major programmes have been sequentially planned and deployed in JJTH starting with Cost Improvement Program (CIP) in 2000, Six Sigma in 2001, Overall Equipment Effectiveness (OEE) in 2003, and Lean in 2005.

Behind these major quality events in J&J, a number of quality tools were adopted and practised in J&J. During the past decades a variety of quality tools and principles have been deployed in J&J as summarised in the PE training presentation (Figure 5.16).



Figure 5.16: J&J's quality journey (Johnson & Johnson 2002b)

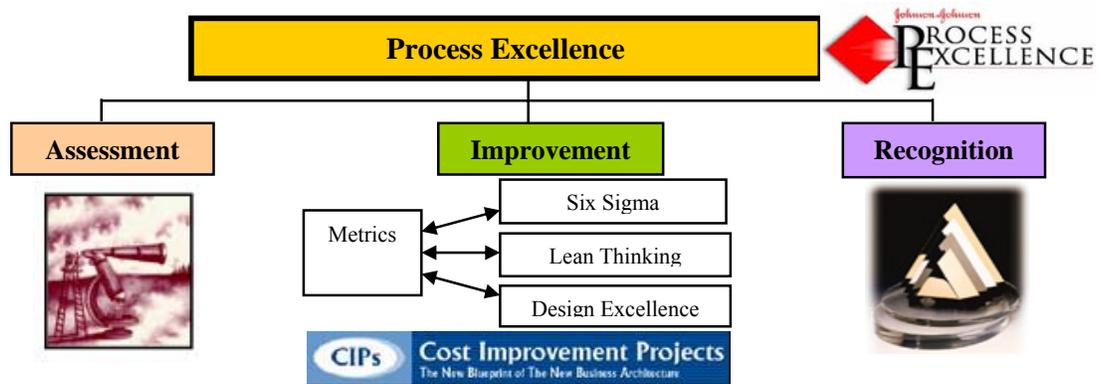
Similarly to the QM development in SCG which consolidates all tools under its TQM framework, the J&J quality journey started from implementing a number of quality improvement tools and today all those tools are integrated into a new system called Process Excellence. ‘...we attempted to prevent PE from being another program but more of a way of integrating a lot of existing improvement stuff’, said a former VP of PE (Avery 2004). ‘Process Excellence borrows ideas from many of these methodologies to form a comprehensive and integrated business process assessment and improvement system’ (Johnson & Johnson 2002b). The twenty-year-old J&J manufacturing plant in Thailand inevitably follows this J&J quality journey initiated from the corporate unit in the US with some time lag in the adoption.

### 5.5.2 Process Excellence at JJTH

‘We will be the best and most competitive health care company in the world and sustain that position through Process Excellence with the use of its assessment and improvement methodologies. This company will never rest in its pursuit of excellence.’

A Chairman and a Chief Executive Officer of J&J, Bill Weldon (2002)

‘Process Excellence is an integrated improvement system that consists of various assessments, improvement and recognition tools that help improve business results and key business processes and establish business process management as a core competency organisation-wide,’ explained a former VP of PE (Best Practices 2003). In 1999 Process Excellence was initiated and implemented across 190 operating companies as a business improvement imperative by the J&J executive committee (Avery 2004; Best Practices 2003). With the aim of sustaining superior business results, J&J deploys PE principles and methodology as a continuous improvement strategy (Johnson & Johnson 2002a). Figure 5.17 shows the J&J’s continuous improvement strategy through PE deployment.



**Figure 5.17: J&J’s continuous improvement strategy through the PE deployment**

PE deployment is composed of three main activities: assessment, improvement, and recognition. Firstly, PE assesses competitiveness, examining operating performance according to seven competitiveness assessment categories (J1.2). The assessment criteria and scoring were based on the Malcolm Baldrige National Quality Award model which was set as the Signature of Quality in 1991 in order to compare J&J businesses against the international standard of excellence (Johnson & Johnson 2002a). The incorporation of SOQ with PE has been changed to the ‘PE assessment guideline’ since 2002. There are two level of assessment: internal and external assessment. The external assessment is carried out once every three years and only J&J organisations that have completed a baseline internal assessment have an opportunity to participate in the external one (Johnson & Johnson 2002a). For improvement, outcome and causal metrics (dashboards) and three methodologies – Six Sigma, Lean thinking, and Design Excellence – are the key components (Johnson & Johnson 2002b; Best practices 2003). Finally, the recognition system is judged based on the overall outcome of the external

assessment which includes gold, silver, bronze, and commitment awards for excellence. In 2005, JJTH received the PE commitment award and it has one certified Master Black Belt (MBB), two black belts, and 28 green belts (J2.1, J2.3).

### ***5.5.3 Importance and triggers of CI at JJTH***

Bill Weldon, a chairman and Chief Executive Office of J&J, told participants in the summit on growth meeting in 2003 that ‘Our Credo is the fabric that allows us to function in a decentralised manner. It guides our decision-making and it is the basis for what I believe is our most competitive advantage and that is our value system.’ Appendix 26 shows the J&J Credo. A trigger for all J&J operating companies to improve continuously is indispensable for the company Credo which guides all actions to fulfil the responsibility to customers, employees, community, and stockholders. Moreover, changes in the competitive environment have forced JJTH to strive for survival and look for cost savings; all ten interviewees stressed this point. The Southeast Asian Director and the Operations Director of JJTH explained the increasing importance of PE and CIP relative to what it was before due to the increasing number of competitors and fierce competition; hence these programmes are crucial for company survival. The Southeast Asian Director explained that:

‘In the past, JJTH did not have these CI programmes because our J&J products were sold out anyway; therefore, at that time we were only concerned with the availability of our product and obtaining a responsive production. However, now we have more competitors that offer cheaper prices and more advertisements which may reduce our brand loyalty. From the perspective of Asia Pacific, PE or CIP are for organisational competitiveness and the improvement of Management Net Income. However, for J&J Thailand plant, we perceive these programmes as for company survival.’

For JJTH, the main triggers to adopt improvement initiatives are the need to improve continuously for the survival of the company and to comply with the Credo guidelines which emphasise the value of continuous improvement for stakeholders’ satisfaction. The Signature of Quality (which today has become the Process Excellence programme) promotes and emphasises continuous improvements and continuous self-assessments (J2.5).

#### 5.5.4 *The approaches adopted overall*

Apart from PE which is a company-wide implementation dictated from the Corporate J&J, the operating companies with a decentralised management style have the opportunity to choose, design, and implement programmes of their own (J1.1, J1.3). A former VP of PE explained that PE is mandatory, and operating businesses in J&J should follow 80 percent of the PE methodologies and 20 percent of their own (Best practice 2003). During the deployment of PE, the Cost Improvement Program (CIP) has been initiated and has started to be implemented in JJTH. The Regional CIP manager explained that ‘When PE started, there was a lack of a management framework and steps to continuous improvement; hence the Thai team designed and implemented CIP in order to provide a management framework and identify potential improvement projects targeting cost reduction’ (J2.5). Following the JJTH roadmap, the next implementations after the CIP are Six Sigma, which aimed to strengthen the baseline and reduce variations, followed by OEE to increase flexibility, maintenance effectiveness, and process capacity, and Lean to reduce waste (J1.2, J2.4, J2.6). Since 2000, the core adopted improvement programmes in JJTH have been CIP, Six Sigma, OEE, Lean, and the new DEX programme. Moreover, GMP has been implemented as a quality standard since JJTH started production.

The problem of initiative overload does not only occur in PTT but it also seems to happen in JJTH. The Operations Director of JJTH explained that:

‘I used to work at Seagate. Seagate started with Six Sigma until it became organisational culture, then implemented Lean. They focus on one programme at a time. However, in JJTH we have very few people and we still implement everything at one time. I think we could not gain the full benefit from doing so many things at the same time.’

It is a matter of limited resources to implement all techniques at the same time and a concern of less benefit gained at the end. The Operations Director of JJTH added that “We hardly have any new products and we have produced old ones for many years. To continue reducing cost on the same products is like *‘squeezing blood from a crab’* [Thai colloquialism; English ‘squeezing blood from a stone’] since we hardly have anything to reduce the unit cost.” Moreover, initiatives fatigue may confuse employees. ‘J&J change plans quite often, which make people feel frustration. Changing CI programmes too often makes people frustrated and lose focus,’ said the regional PE of Asia Pacific and the regional Lean manager (J2.1, J2.1).

### ***5.5.5 The reasons for PE, CIP, Six Sigma, Lean, and GMP: cost savings rather than quality improvement***

Cost savings, a chosen means of survival, is the main reason for all PE activities at JJTH. According to the Operations Director, the highest priority for JJTH operating performance is measured by the CIP achievements or cost savings followed by the Management Net Income (MNI) and Profit and Loss statement (P&L). He explained that ‘MNI and P&L are affected by external influences such as changes in oil prices and material costs which we cannot control but CIP is our management task’ (J1.2). Nine out of ten interviews with senior managers and departmental managers agreed that the final achievement of all these PE, CIP, Six Sigma, Lean, and OEE initiatives is the quantified cost savings, and only the QTA director perceived quality as the main concern and that financial performance will be a by-product. Appendix 27 illustrates the ranking of the reasons for undertaking improvement programmes from ten interviews with senior managers. Although Six Sigma is a tool to reduce process variation, Lean is to reduce waste, and OEE is to improve capacity, their projects must make sure that they deliver cost savings. The regional CIP manager said ‘It is true that many of our tools overlap with the tools in TQM but we choose CIP because we are not a Japanese company and the name of Cost Improvement Program is a better fit to our strategy of cost competitive advantage’ (J2.5). It is clear that quality is not the main target for the adoption of all these tools but rather the financial benefits.

The next question which arises is whether product quality will be affected by these cost improvement programmes. The Operations Director admitted that some projects in cost improvement programmes may have a negative impact on product quality; therefore, JJTH prevents this by including QTA personnel, who have the responsibility to ensure product quality, in a cross-function project team (J1.2). The Director of QTA in JJTH also addressed this concern about the tradeoffs between lowering cost and quality. However, she said that the QTA team must assure and maintain the level of confidence in quality by looking at customers’ requirements when cost is reduced (J1.3). Quality in JJTH means satisfying consumers’ requirements (J1.3). The total number of customers’ complaints has been gradually increasing since 2004 but within one standard deviation. This shows that implementing all cost-cutting programmes may have an impact on the number of customers’ complaints but not significantly, although QTA has protected

some level of confidence in product quality. Appendix 28 shows the total number of customers' complaints in J&J Thailand manufacturing plant and from Thai consumers. Since JJTH started, Good Manufacturing Practice (GMP) has been implemented as a foundation for the quality system and it is a regulation from Corporate J&J (J1.2, J1.3). JJTH has not applied for ISO9001 since JJTH already has the Signature of Quality (J2.1, J2.2, J2.5) and the managers believe that GMP applies better than ISO9001 in terms of its focus on manufacturing and provides a protection system to avoid contamination of products (J1.2, J1.3, J2.6). The Director of QTA explained that 'the ISO system emphasises documentation but GMP is deeper in terms of the method to manage quality.' Unlike both SCG and PTT where the achievement of national and international quality awards is their goal for successful quality management, JJTH has not applied for any quality award outside its firm. The director of QTA and the regional Lean manager said '...senior managers in JJTH are not aware of quality awards since we are so busy and we respect our corporate J&J more than Thai society' (J1.3, J2.1). Moreover, JJTH already has its own competitive assessment for applying the PE award (J2.1, J2.2). Already having SOQ and PE assessment, JJTH does not adopt ISO9001 or quality awards. These two examples indicate that JJTH is in favour of adopting strategic-led decisions and pay-offs rather than following trends.

The reasons for the adoption in the JJTH case are slightly different from those in the other two cases. Payoffs or benefits gained with their clear link to the company's Credo and these objectives are the prime reasons for JJTH to pursue the adoption of these initiatives, and less attention is paid to Thai culture and the management fashion issues. JJTH believes in first adopting tools, building a system, and corporate culture, and that employees need to change and adjust accordingly (J1.1, J1.2, J2.1, J2.3, J2.5, J2.6, J2.7). Although Thai culture is not an important criterion before the adoption of initiatives in JJTH, some implementation such as Lean, which involves headcount reduction, consider this sensitive issue by keeping this benefit secret and not communicating the link between Lean implementation and the layoff action (J1.2). Thai culture may not be the concern but the culture of JJTH may influence the selection decision. The manufacturing manager and supply chain manager agreed that before adopting any tool, JJ senior management team will evaluate whether it could play to the strengths of JJTH and fit to JJTH culture in which JJ people are fast learning and require quick results (organisation fit) (J2.2, J2.6, J2.7).

Since 2000, the task for the operations department in JJTH has been not just to produce goods but also to implement new improvement initiatives as a policy from the corporate J&J. While JJTH retains the minimum standard of quality through the GMP system, the ultimate goal for the adoption of these improvement approaches is cost savings rather than quality improvement as a focus of the TQM principle. The Regional CIP manager (J2.5) explained the reasons JJTH adopted these programmes in order (CIP, Six Sigma, OEE, and finally Lean):

‘CIP must be done first in order to build a management framework and process to identify potential cost improvement projects and estimate the target scope. Six Sigma helps strengthen the baseline, reduces process variation and supports other programmes. After the process is stable, OEE follows to increase machine capacity and flexibility. Once the processes and machines are ready, then Lean can be implemented by focusing on customers, speed, and non-value added activity.’

The specific reasons and motivation for the adoption of JJTH improvement programmes from ten interviews with the directors and senior managers are summarised below:

**Table 5.13: Summary of reasons for the adoption of CI initiatives in JJTH**

The adopted initiatives	no.	Specific reasons and motivation for the adoption	Category	References (Interviewees)										Sum		
				J1.1	J1.2	J1.3	J2.1	J2.2	J2.3	J2.4	J2.5	J2.6	J2.7			
Overall	1	Policy from J&J corporate company	S	1	1	1	1	1	1	1	1	1	1	1	1	10
	2	Survival through cost savings	P	1	1		1	1	1	1	1	1	1	1	1	9
	3	Other companies show good results from the adopted initiative (best practice)	F			1	1									2
GMP	1	Provide deeper method and protective system to avoid contamination in product. Housekeeping	P		1	1	1							1	1	4
	2	Foundation for quality management system	P			1	1							1	1	3
	3	Policy from J&J corporate company	S		1	1								1	1	3
	5	Safety compliance with Thai regulations	P		1											1
Process Excellence (Six Sigma)	1	Regulation from J&J corporate company as a company-wide implementation	S	1	1	1	1	1	1	1	1	1	1	1	1	10
	2	Self-assessment to identify areas for improvement through SOQ PE assessment	P	1	1	1	1		1					1	1	6
	3	Build organisational culture for problem solving	P		1							1	1	1	1	4
	4	Reduce process variations and defect rate	P		1		1					1				3
	5	Perceived benefits from GE	F				1									1
CIP	1	Cost reduction	P	1	1		1					1				4
	2	management framework for cost improvement	P									1				1
OEE	1	Improve capacity, productivity, and flexibility	P				1				1	1				3
	2	Corporate support	S	1								1				2
Lean	1	Shorten process, reduce waste and non value-added activity (value stream mapping)	P		1		1					1	1	1	1	5
	2	Reduce cycle time, increase speed, flexibility, and increase customer service	P		1		1					1	1	1	1	5
	3	Reduce inventory	P		1		1					1		1	1	4
	4	Reduce headcount	P		1											1

Category F = Fashion setting, P = Payoffs, S = Strategic fit, O = Organisation fit  
 1 means the interviewee has mentioned or expressed their specific reason and motivation to the adoption

**5.5.6 Effectiveness of CI approaches**

The CIP programme is a key strategy and major achievement of the JJTH plant. The Southeast Asian Director of J&J strongly believed this and said that ‘Without CIP our J&J in Asian Pacific would not acquire growth. It has a direct impact on the operating financial performance.’ The cost improvement performance of JJTH has achieved the

CIP target for five consecutive years. From 2001 to 2005, JJTH delivered annual cost savings, which calculated from all improvement activities in the Thailand plant, approximate at \$1 million, \$3 million, \$4 million, \$5 million, and \$5.8 million USD respectively. Ten interviewees rated CIP and GMP as the most effective programmes followed by PE assessment which they believed helps identify weaknesses under J&J standard criteria. Six Sigma or PE was rated moderate. The engineering manager commented that the Six Sigma process consumes time and resources, and it takes a long time to see the result (J2.2). Moreover, Six Sigma application is mostly based on manufacturing, so it is difficult to apply to other areas, such as marketing and sales as the PE manager remarked (J2.3). Lastly Lean was rated as not effective since JJTH has only just started its implementation.

The explicit cost to implement these improvement programmes mainly comes from consultant fees, training for qualifications especially in training PE belts, and workshop and testing cost in Six Sigma and Lean projects. Six Sigma alone cost 1 million THB for the initial training (0.2 million THB per person) and after 2004 MBB of JJTH has been able to deliver in-house training which reduced the annual training cost to 0.3 million THB per year (J2.3). The OEE implementation cost 1 million THB per year, paid to AT Kerney consultants, who helped its deployment in JJTH. Another hidden cost is the loss in working hours which has not been measured. Apart from financial investment, the duration to implement PE or Six Sigma is five years, of which three years are for training and two years to build in a culture (J2.2, J2.3). This is similar to Lean deployment which will take three years for training and another year or two for cultural change, as the Regional Lean manager described (J2.1).

### ***5.5.7 Critical success factors and barrier to CI***

‘The critical success factors for all CI activities are that everybody understands by being able to sing the same song and commit to the programme.’  
(Southeast Asian Director of J&J and Manufacturing manager of JJTH, J1.1)

Ten interviews in JJTH summarise the critical success factors and barriers to improvement as follows:

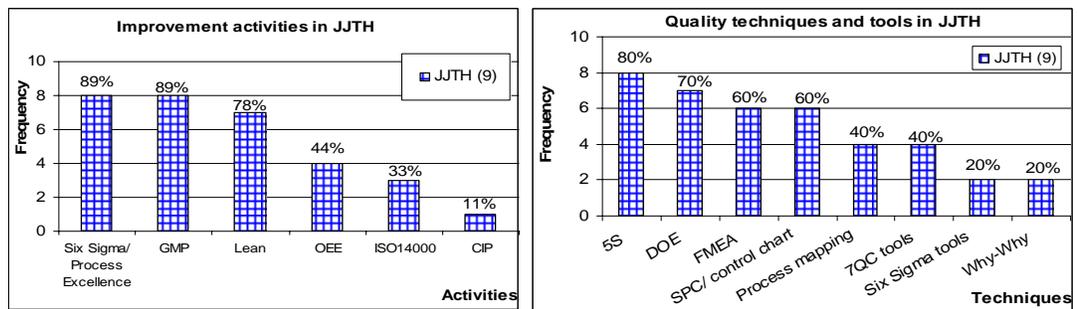
- **Thai culture and peoples’ attitude towards improvement.** Once people think and feel that they are already the best, there would not be any improvement (J1.1). A positive attitude towards CI is important (J1.1, J1.3, J2.3). ‘This is not a problem in

JJTH since employees understand that all the adopted programmes are for organisational competitiveness and the result will return to them' (J1.1, J2.5). However, adopting the programme without considering Thai culture becomes a barrier in execution and hence needs clear communication and good planning (J1.3). The Director of QTA said "We lack thinking about what we need to be aware of to have a successful implementation. We implement whatever the J&J corporate command us to do and solve the problem later. Thai people do not have good discipline and commitment to action. Our Thai attitude lacks 'commitment to achievement' and says only 'I/we will try'; hence people do some PE without commitment." The regional PE manager asserted that the weaknesses of Thai culture are that Thai people are quiet and rarely give opinions or suggestions; hence the managers solved this problem at the beginning by recruiting more outspoken Thai employees (often overseas graduates).

- **Communication.** Clear communication to convince people to buy to the programme, and let them understand the reason for the adoption, its priority, and its benefits are important for successful implementation (J1.1, J2.2, J2.5, J2.7). Adopting new tools creates additional work in employees' opinion; however, managers must fully support this and provide clear communication that these tools should be used in daily work (J1.3, J2.2).
- **Reward and recognition.** People are a major driver for improvement. Recognising people's achievements in the programme through awards such as money, and/or honour shields would increase their motivation to improve (J1.2, J2.1, J2.4)
- **Management commitment.** The top management teams must lead and show leadership and a clear standpoint on the importance of continuous improvement and the fact that the J&J Credo has given a clear and significant guideline about CI (J1.1, J1.3, J2.4, J2.7). Moreover, management must support and commit to the adopted programme (J2.1, J2.3, J2.5, J2.6). The Regional Lean manager said 'Lean lacks management support hence it is hardly executed although there is a promoter. The need for management support is also a reason why JJTH rarely create our own programmes and we must follow our regional decisions.'
- **Resources for implementation and priority of the initiative.** There are many adopted initiatives and less people to implement them; hence there is a resource constraint (J2.5) and prioritising important programmes is important (J2.1, J2.4).

**5.5.8 Drilling down- opinions of employees**

For triangulation, the author conducted a more detailed study to obtain views from staff who deploy these improvement programmes. Nine interviewees including PE belts, engineers, and production leaders were selected by the author and the MBB. They were individually interviewed and filled in the questionnaire about their understanding and attitude towards improvement programmes in JJTH. Appendices 29 and 30 display the results of analysis of the questionnaires. The most frequently practised improvement activities are GMP and Six Sigma or Process Excellence (89 percent), followed by Lean (78 percent), OEE (44 percent), ISO14001 (33 percent), and only one person said CIP. All the adopted programmes described by the managers at JJTH are also mentioned by engineers and the PE team. Like SCG and PTT, 5S is the most popular technique in JJTH as mentioned by 8 out of 9 people. However, JJTH people used more advanced and complicated tools such as DOE (70 percent), FMEA (60 percent) and SPC (60 percent) rather than those tools such as 7QC tools (40 percent), and 7 management tools (0 percent) that are widely employed in SCG and PTT case. The adopted quality techniques are associated with the adopted programme i.e. the TQM firms (SCG, PTT) use more of the 7QC tools; while the Six Sigma firm (JJTH) prefer DOE, FMEA, and SPC. Only 5S is a prominent quality technique in all three firms regardless of what improvement programmes the company pursued. Figure 5.18 illustrates the frequency of improvement activities and quality tools that are currently practised in JJTH.



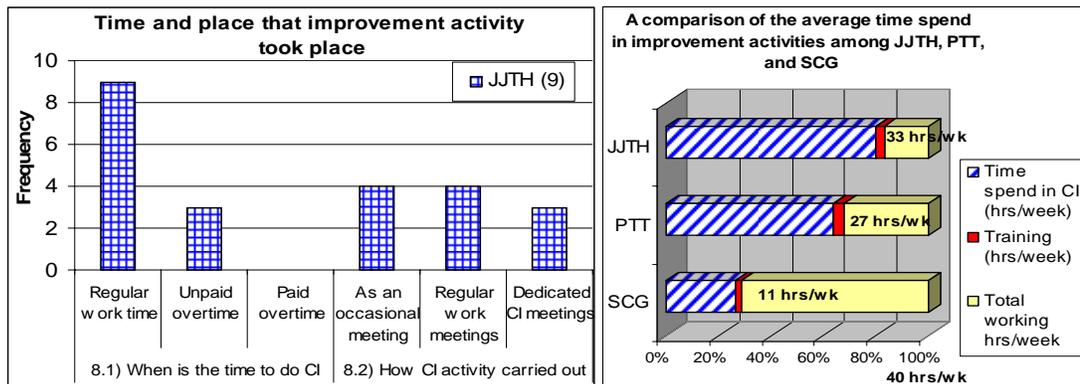
**Figure 5.18: Improvement activities and quality techniques at JJTH**

These improvement activities are conducted during regular working time, sometimes during unpaid overtime, and none of them were done as paid overtime. Moreover, these activities took place in an occasional meeting, regular work meeting, and sometimes in dedicated improvement meetings. The average time spent on improvement programmes

plus training hours in JJTH is around 33 hours per week which is almost 83 percent of normal working hours (40 hours per week). These time-consuming activities have been criticised as a disadvantage by the maintenance improvement manager who has worked at in JJTH for more than 25 years and found a drastic change in the system during the past five years of implementing PE programme. As he said:

‘Although adopting new tools helps develop our employees, widen their knowledge of problem solving, and identify root cause of a problem such as the Six Sigma programme, there are two disadvantages from it. The Six Sigma programme trains Green belt and Black belt to aim for project achievement and the project owner will receive an additional bonus once the project finishes. As a consequence, people do not work on their routine job and become obsessed with the Six Sigma projects. Moreover, after one project finishes, they move to another. No one carry on with those changes and so a mess is left for production.’

The frequency of time and place that improvement activities took place and the average time spent on these programmes are shown in Figure 5.19. The average time spent on improvement activities for the company which adopted the Six Sigma approach (JJTH) is almost three times more than a TQM led company (SCG).



**Figure 5.19: Time and Place to conduct improvement activities in JJTH**

All nine interviewees realised the necessity of continuous improvement and supported their activities mainly for the survival and competitiveness of the company. The factors which motivate them to participate in improvement activities can be divided into four categories as summarised in Table 5.14. Similarly to the SCG and PTT cases, a majority of the reasons are for their own benefits followed by benefits to the company, characteristics of improvement activities and a supportive top management team. Appendix 29 shows the frequencies of the motivation factors for CI activities, which were expressed by PE team in JJTH.

**Table 5.14: Category of motivation to participate in improvement activities in JJTH**

Frequency	Category of motivation to improvement activities in JJTH
Majority 	<b>Group 1: Benefits to employee</b> <ul style="list-style-type: none"> <li>▪ 33% [Daily work] Helps working better</li> <li>▪ 33% [Recognition] Employees feel proud of being part of the company’s improvements. Employees like to be recognised.</li> <li>▪ 33% [Self-improvement] Opportunity to learn new things, enhance employees’ knowledge</li> <li>▪ 11% [Happiness] Enjoy working with these activities</li> </ul>
	<b>Group 2: Benefits to the company</b> <ul style="list-style-type: none"> <li>▪ 33% [Business’s result] Enhance business growth, prosperity, competitiveness, and customer satisfaction.</li> <li>▪ 33% [Operating performance] Clearly increase operating performance e.g. product quality, reduce production waste and cost.</li> </ul>
	<b>Group 3: Characteristics of improvement activities</b> <ul style="list-style-type: none"> <li>▪ 33% [Challenging] Challenging tasks and has new techniques to try.</li> <li>▪ 11% [Root cause analysis] Many Six Sigma tools e.g. why-why, fishbone, DOE, statistical analysis help us reach root cause of the problem.</li> </ul>
Minority 	<b>Group 4: Supportive elements</b> <ul style="list-style-type: none"> <li>▪ 22% [Top management support] Need support from top management.</li> </ul>

**5.5.9 The future for Process Excellence at JJTH**

JJTH began the Process Excellence journey with the aim of building a continuous improvement culture in 2001, after J&J corporate ordered a compulsory PE framework throughout its operating companies. An implementation roadmap has been planned and tailored by the senior management team in JJTH starting from Cost Improvement Program, Six Sigma, OEE, and today JJTH is executing Lean. PE assessment is the next task. All the adopted improvement activities are still running and embedded under the same umbrella of PE targeting cost improvement. JJTH is under an ongoing development of J&J Process Excellence which is composed of three main components: assessment, improvement, and recognition.

**5.6 DISCUSSION AND CONCLUSION**

These three case studies have provided the main empirical evidence for the research. The development of QM from three case companies reveals the enlargement in scope of QM and CI which has expanded from focusing solely on quality to organisational improvements. A large number of the adopted improvement initiatives were plotted in series over time. The repeated triggers for the adoption are the need to survive, sustain

competitiveness, increase operational effectiveness in terms of cost, quality, and productivity, and the continuous improvement mindset. These motivations drive companies to search for and implement new improvement programmes.

The data above indicates from these three cases show that the adoption of these programmes consumes a large amount of time and resources. The problems of initiative fatigue and the difficulty to manage all improvement programmes at the same time were revealed in all three case companies. Indeed, the evidence signifies the need for a company to manage and carefully select both old and new improvement activities to avoid the problem of initiative overload and ensure successful implementation. Although there is no evidence of a structured selection process or framework from these three case companies, a number of criteria were used to justify adoption of initiatives in each case.

Four selection views have emerged from these three case studies: fashion setting, pay-off, strategic fit, and organisation fit. Fashion setting represents the adoption resulting from the persuasive power of consultants, new trends, and best practice from books, news, and from successful companies. Secondly, pay-offs or the perceived benefits gained from implementing the initiative are the most cited criteria for adoption, followed by the strategic fit to company's objectives and direction. Finally, organisation fit describes the factors concerned with suitability for the organisational culture, Thai culture and the capability of employees. Nevertheless, the emphasis given to each one varies between SCG, PTT, and JJTH, depending on the company's context and needs at the time. SCG and PTT adopted the programmes with the aim of improving their operating performance as well as developing their employees; hence Thai culture became one of their key concerns. JJTH focused on cost improvement and building the system, and not on people development. This result aligns to the operations strategy theory (Voss 2005; Hayes *et al.* 2005) that the selection needs tailoring to the company context, focus, and time (Leseure *et al.* 2004). Hence, to support the selection decision for improvement initiatives a directive and not a prescriptive approach is more suitable, which can be tailored to the company's context. Chapter Six describes the cross-case analysis and elaborates the lessons learnt from these case studies to provide a theory of adoption.

## **CHAPTER 6. DEVELOPING A FRAMEWORK OF SELECTION**

This chapter develops a theory to describe the selection of improvement initiatives. The theory of selection was developed from triangulation of the three in-depth case studies described in Chapter Five plus a number of interviews with experts in quality management. This chapter also relies upon the work described in Chapter Four, which established a conceptual background. Section 6.1 presents the initial elements of the selection framework which was developed from the conceptual background in Chapter Four and was further developed from case studies in Chapter Five. Section 6.2 outlines the results of interviews and discussions with industrialists, QM academics, and consultants. The interview analysis explored both rational and irrational influences in the selection of improvement initiatives. Section 6.3 presents a summary of the cross-case analysis. Section 6.4 explains the theory of selection, and the preliminary selection framework which was developed by combining the key selection criteria and the previously explained elements of this selection theory. Section 6.5 discusses other areas associated with the selection process and section 6.6 presents the conclusion of this chapter.

### **6.1 Initial elements of the framework**

The empirical case studies in the previous chapter have acknowledged the importance of careful consideration of the adoption of improvement initiatives. A selection framework is an ongoing development. Figure 6.1 portrays initial elements of the framework which has been refined from an initial conceptual background in Chapter Five through the three in-depth case studies of SCG, PTT, and JJTH. Based on these case studies, the motivation for the adoption of QM and improvement initiatives are: the need to survive, as well as to sustain company competitiveness; the mindset of never-ending improvement; the creation of quality culture; and improvements in productivity, cost, and customers' satisfaction. On the basis of these triggers, the four main criteria which influence the choice made can be grouped into fashion setting, pay-offs, strategic fit, and organisation fit. After the company decides what to adopt, there are barriers to the execution, such as resistance to change, lack of co-operation from employees, and lack of resources to implement the change. Hence, understanding critical success factors during the selection decision is important to help managers work towards a successful

implementation. Common critical success factors of these improvement initiatives include top management commitment, positive employee attitude, clear communication, and rewards and recognition schemes. All these elements have been incorporated into the initial conceptual background and are presented as initial elements of the framework below.

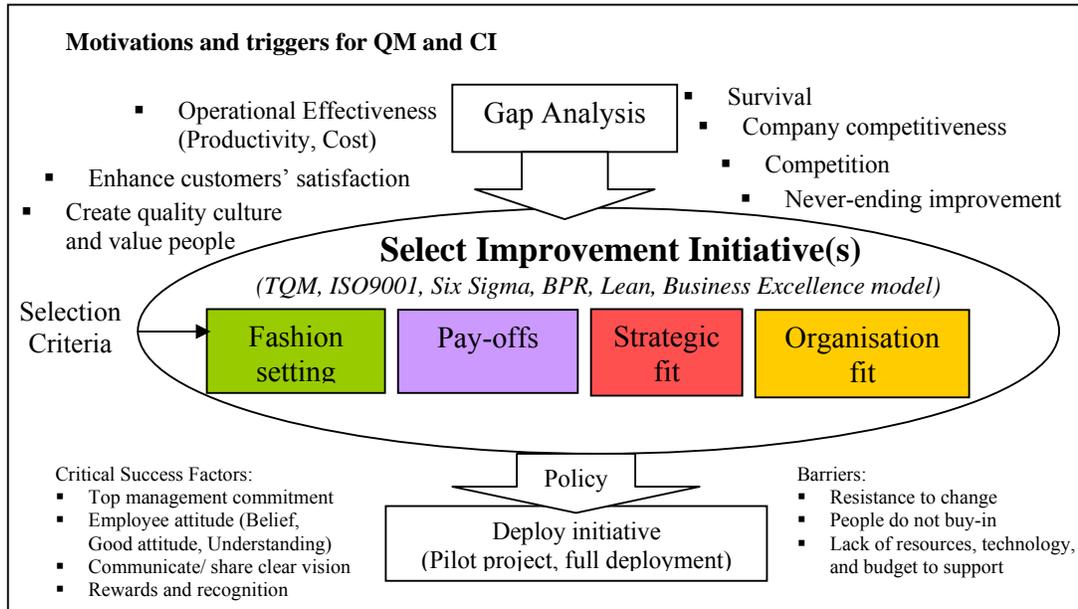


Figure 6.1: Initial elements of the framework

Based on this Figure 6.1, the preliminary framework is further developed and refined through interviews with experts in QM as described in the following section.

## 6.2 INTERVIEWS WITH EXPERTS

Experts including academics, consultants, and managers in leading companies in Thailand are perceived as gurus and therefore become disseminators and facilitators for Thai companies to implement a number of improvement initiatives created abroad. Hence, information from these experts reveals which are the popular and currently practised quality improvement initiatives and gives an insight into how these programmes have been spread and adopted in companies in Thailand. Triggers for the adoption, major driving forces and barriers to conduct improvement programmes in Thai organisations were discussed during these interviews. Additionally, the experts' criteria and approaches for selecting and suggesting improvement programmes to companies are presented. Semi-structured interviews were carried out with 14 experts in

QM comprising three academics, three consultants, eight experts who are the government officers related to QM and the TQM promoters in Thailand and six key decision-makers in two additional case companies (four from the top management team in AIS and two managers from Toyota Motor Thailand). A list of the interviewees, descriptions of them, and details of the duration of the interviews are summarised in Appendix 10.

### ***6.2.1 Popular quality management and improvement initiatives in Thailand: TQM and ISO9001 or Six Sigma and Lean?***

Although Six Sigma and Lean are currently ‘hot’ improvement initiatives disseminated worldwide (see trend graphs in Chapter Four), TQM and ISO9001 continue to be popular quality management approaches in Thailand. Eleven experts and both the AIS and TMT companies indicated TQM as their chosen major programme which has been suggested to their clients or implemented in their companies (E1, E2, E3, E4, E7, E8, E9, E10, E12, E13, E14, A1.1, A1.2, A1.3, A1.4, T1.1, T2.1). ISO9001 and the application for Thailand Quality Award are the second most recommended programmes by nine and eight experts respectively. A breakthrough change by BPR is not recommended by Thai experts due to the fact that it is perceived as in conflict with and inappropriate to Thai culture, which values seniority and is sensitive to dramatic changes in process and layoff issues (E1, E14, T1.1). The President of FTQM gave an example of BPR failure in Kasikorn or Thai Farmers’ Bank:

‘Its implementation consumed two billions baht and did not deliver success to the whole organisation. BPR can only apply to and improve some processes due to the fact that it is unfit to Thai culture and it redesigned the process without having a standard so the PDCA cycle was not complete. Hence other organisations in Thailand do not dare to adopt it.’ (E14).

Moreover, BPR is already out of fashion in Thailand (E2, E5, E14, A1.1). Six Sigma and Lean concepts are new in Thailand and only five experts who are academics and consultants (E1, E2, E5, E6, E13), and two managers in Toyota Motor Thailand, knew about them (T1.1, T1.2).

TQM is a well-embraced concept in Thai companies, given that many leading Thai companies such as SCG, AIS, and Toyota Motor Thailand believe in and support this approach. AIS is Thailand’s leading mobile phone and wireless service company with

\$2.4 billions in turnover and 4,930 employees in 2005. Satisfying customers' needs and quality are the main drivers for the sustainable success of the AIS business (A1.2). Recently, the company has adopted the TQM concept and the House of TQM designed by Dr.Kano, modified them into the AIS House of Total Quality Service, and launched this as a company-wide deployment in 2004 (A1.1, A1.2, A1.3). Although AIS has tried some quality tools in the past, the company is quite new to QM and CI approaches. The company's decision to adopt the TQM approach indicates that the TQM remain a popular idea today and its selection decision supports the framework development for this research.

Toyota Motor Thailand (TMT) is the largest manufacturer in Thailand and a major production centre for Toyota Motor Corporation pick-ups with a capacity over 400,000 vehicles per annum (Toyota Motor Thailand 2005). The Toyota Way 2001, a series of guiding principles for the global Toyota organisation, is based on the two philosophies of 'Continuous Improvement' and 'Respect for People', with the aim of delivering value to customers, shareholders, associates, business partners and the global community (Toyota Motor Corporation 2001). The General Manager of the Quality Assurance Department said 'The Toyota Way is only a global strategic direction that all Toyota plants must follow but we have to design our own strategy based on this global guideline' (T1.1). Like other TQM firms in Thailand, TMT uses the house of TQM as the company's framework for quality strategy and activities. In manufacturing, TMT employs the Toyota Production System (TPS) comprising of Just-In-Time (producing only the right parts and the right quantities at the right time) and Jidoka (a fail-proof system), concepts which are based on standardised work and kaizen (Toyota Motor Thailand 2005, T1.1). All activities in TMT include TPS (TQM, QCC, 5S, ISO9001, and JIT), Toyota Service Management, and Thailand Quality Award, which aim to deliver highest quality, lowest cost, and shorter lead time (T1.1, T1.2). Toyota is the pioneer of the TPS and Lean concepts; hence having some insight from TMT would enrich the picture of adoption strategies. Figure 6.2 illustrates the TQM framework in AIS and TMT.

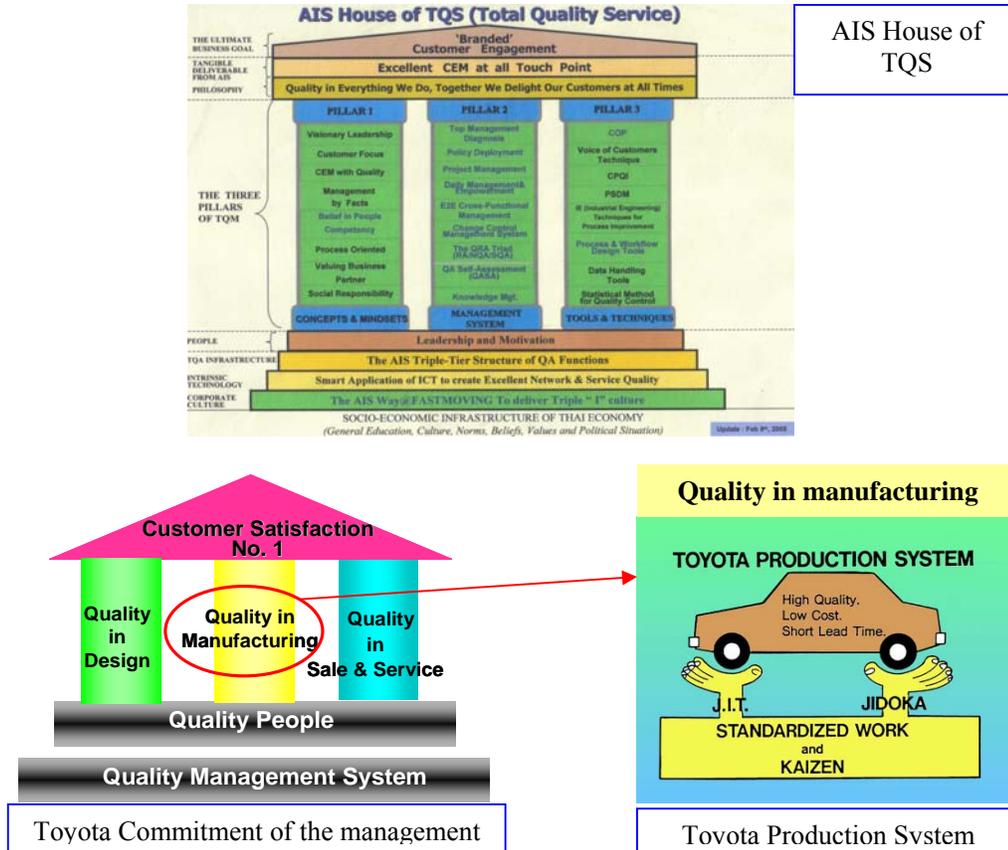


Figure 6.2: TQM framework in AIS and TMT

From the experts' points of view and company practices, TQM and ISO9001 still persist as QM and CI approaches in Thailand. Many leading companies in Thailand which represent best practice continue supporting and sustaining the usage of TQM concepts and draw other Thai companies to follow.

6.2.2 Triggers for the adoption

From all interviews, motivations for the adoption of QM and CI initiatives could be grouped into two: external factors (i.e. institutional push, trade barriers, and company image) and internal factor (i.e. the need to be competitive). This finding in Thailand is coherent with the study of triggers to the adoption of management initiatives in the UK (Leseure *et al.* 2004) and the persistence of TQM in New Zealand (Venkateswarlu & Nilakant 2005).

Firstly, TQM and ISO9001 are still popular in Thailand partly because of the continuous support from government related-institutions which educate and motivate

Thai companies to the adoption of QM and CI approaches. There are three recognised institutions (government and consultancy firms) which provide knowledge and promote the adoption of QM and improvement programmes to Thai organisations. The Office of the National Accreditation Council (ONAC) supports the adoption of ISO9001, while the Thailand Productivity Institute (TPI) provides all kinds of consulting services for improvement initiatives, and the Foundation for TQM promotion in Thailand (FTQM) promotes the TQM philosophy. Firstly, ONAC, established in 1995 under Thailand's Ministry of Industry, is responsible for determining the policy and direction of Thailand's accreditation system which aims to harmonise national standards with international ones (E11). Therefore, all international standards including ISO9001, ISO14001, and ISO IEC 17020 are promoted by this government institution in order that these standards are embraced by both small and large organisations in Thai industry. The director of ONAC said:

‘...The government policy supports the implementation of ISO9001 in order that 1) Thai companies (both small and large) to have a better systematic management system, to create consistency in quality, and to reduce cost which all benefits customers and 2) build competitive capability.’ (E11)

He perceived that ISO9001 is a standard and main force that pushes CI forward as he said ‘during the past ten years our entrepreneurs have significantly improved. Before they did not even know what inspection, QC, or sequences of production were, now they have all systems in mind, start having documentation, and give training to their employees.’ Secondly, TPI, which was founded in 1962 and became an autonomous unit in the Ministry of Industry in 1994, is a national consultancy organisation responsible for training, consultation, and provision of information needed in productivity and quality improvement to improve Thai industry (TPI 2004). The Deputy Executive Director of TPI said, ‘At present we attempt to promote and stimulate Thai organisations to pursue and apply for the Thailand Quality Award, 99.98 percent of which was translated from the Malcolm Baldrige National Quality Awards (MBNQA) of America’ (E4). Thirdly, FTQM, established in 2002 by the National Science and Technology Development Agency (NSTDA) and TPI, supports and promotes the application of TQM to Thai organisations in order to improve capability in management and hence increase the company's effectiveness (FTQM 2007).

Moreover, many Thai companies adopted ISO9001 because of the requirement from customers and suppliers particularly from those in the European Union. Many experts

perceived this requirement as a trade barrier for the European markets (E4, E8, E10, E12). The GM of QA Department said:

‘Although The Toyota Way and our TPS are already very good and cover all requirements of ISO9001, our TMT still implement it in order to reduce the trade barrier. We also found that by following ISO9001 guidelines, our documentation system has become clearer and we could see all linkages of our documents throughout the plant’ (T1.1).

The Trade barrier was a trigger for TMT to apply for ISO9001 certification. Enhancing the company image is another motivation for its application for quality awards. TMT has been considering and applying for The Prime Minister’s Industry Award in 2002 and the Thailand Quality Award in 2003 under its vision to be a leading and globally recognised company (T1.1).

Apart from the promotion from these three established institutions, trade barriers, and company image, many companies in Thailand realise the need for and value of continuous improvement in order to survive in a highly competitive environment, improve their operational effectiveness and profitability, and create company reputation (E1, E3, E6, E7, E8, E9, E13, A1.3). These internal factors were also identified in the previous three case studies as triggers for the company to adopt these improvement initiatives.

### ***6.2.3 Expert criteria for selection: organisation fit and strategic fit***

Both external and internal triggers enhance the role of experts to give advice on management fashion. For many Thai companies, consultants and academics become trainers and advisers about the implementation of QM and CI initiatives (E2, E5). Hence, the expertise and beliefs of experts partially determine and shape management fashion in Thailand. The director of ONAC believes that ISO9001 helps build quality and CI awareness into Thai culture (pay-off) and it is a widely accepted standard (fashion). He suggests every organisation must have ISO9001 as a minimum (E11). On the other hand many experts believe in TQM as a management framework, and that quality awards like TQA are tools to measure the success of TQM, and that other initiatives such as Six Sigma, Lean, and ISO9001, are supplementary tools within the TQM framework (E4, E7, E8, E10, E12, E13, E14). On the contrary, a senior consultant at the Thailand Productivity Institute, a former Quality Financial Officer for Six Sigma

and a Master Black Belt in GE for 7 years, values Six Sigma above any other programme. She believes it is the only initiative that provides quantified results of improvements (pay-off) which could easily make management buy in and is a reason for the adoption (E6).

In addition to the persuasive influence of experts, many Thai organisations follow the leading companies in their industry (e.g. Citibank in Thailand adopted Six Sigma because of GE) (E6), and widely adopted and promoted programmes in Thailand (e.g. TQM, ISO9001) (E9, E10, E11). The Best practice of the 'TQM house' in SCG, which was advised by Dr. Kano, have also been adapted and used as the 'AIS House of TQS' (A1.3). Since Thai culture encourages people to learn new things, accept new ideas, and to be highly flexible (E1, E3, E12), Thai people tend to try new things, and particularly try the management fashions suggested by experts and best practice (fashion setting). However, Thai people will fully commit to the programme and would not desert the adopted initiative if it is well communicated, understandable, and acceptable (E1, E3). Accepting the influential factor of fashion setting, Professor Adulpan said 'any organisations which follow fashion may lose money and time; however, at least they have tried it and would know whether or not the method will be appropriate to the company' (E3).

Nevertheless, all interviews with experts reveal that experts do not simply recommend a fashionable programme but that a number of reasons were raised to justify their choice. Degree of fit to the organisation and Thai culture (organisation fit) and alignment to the company's vision (strategic fit) are major considerations for the selection of improvement initiatives from the experts' perspective. A number of barriers to conducting CI in Thai organisations affect the criteria for selection. Out of 20 interviewees, 18 mentioned gaining commitment from top management and getting employees' buy-in, while seven mentioned that resistance to change among the most significant obstructions. Moreover, the educational level of employees, and the lack of knowledge, technology, and resources are worrying factors as raised by three to seven interviewees. Two experts said a small number of firms are unaware of QM and CI. The Director of NSTDA compared a good consultant to a plaster cast: once it is taken off, the company can continue by itself (E7). Therefore, these barriers to implementing CI initiatives in Thai organisations lead a majority of experts to consider fitness to

organisation (organisation fit) before recommending a programme to clients (E1, E3, E6, E8, E14). This will help ensure a successful execution and sustainable improvements, as one of the objectives for the implementation is to build a quality and CI culture (process and people) in Thai organisations (E1, E4, E7, E11).

The appropriateness to company's culture is presented as a major consideration in AIS Company. The Assistant Vice President of Network Quality Management of AIS explained that:

‘Managing a Service Company nowadays becomes more complicated and a strong management system is needed; otherwise, we cannot sustain our leading position. We consider our culture every time we introduce new programme (e.g. acceptance of the programme).’ (A1.2)

The Assistant Vice President of Service Quality Management gave the following reason for TQM:

‘We choose TQM because the concept enhances employees' participation in improving our working process better than ISO9001 did and it is appropriate to our culture. However, Six Sigma is not appropriate to our service culture since it significantly consumes daily working hours. Our telecommunication company cannot afford that.’ (A1.3)

The Chief Customer Champion & Terminal Business Officer also supported this idea:

‘We believe that our Thai company must always study new evolution and adopt the one which is most suitable to our context and culture. We like the concept of total quality and the house framework so we adopted them and use our culture to drive quality and improvements. Quality culture must develop first and use other tools to enhance our business goals.’ (A1.1)

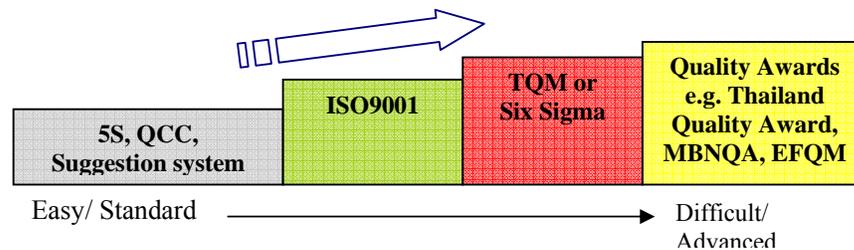
For Toyota Company, The Toyota Way provides a general guideline for thorough consideration in decision-making. It emphasises four main considerations: 1) concrete proof after thorough study and testing, 2) awareness of risks and contingencies, 3) prioritisation of the greatest possible outcomes, and 4) total optimisation of the whole company (Toyota Motor Corporation 2001). Toyota's suggestion for decision-making requires careful consideration before adopting any action i.e. pay-offs, organisation fit, and strategic fit.

In addition to a concern with organisation fit, eleven experts use the alignment to company direction, vision, or objectives as one criterion for their suggestion (E1, E2, E4, E5, E6, E7, E8, E10, E12, E13, E14). This strategic-fit criterion is reflected in their proposed selecting process described in the following section. Triggered by the external

and internal factors for the adoption of QM and CI initiatives, fashionable programmes have been introduced by experts and best practice in Thailand using pay-off as their persuasive arguments. Accepting the fashion influence, experts have their rational justifications of the recommended choice. Both organisation fit and strategic fit are experts' major considerations surfacing through their selecting process.

#### 6.2.4 Current approaches for the selection of improvement initiatives

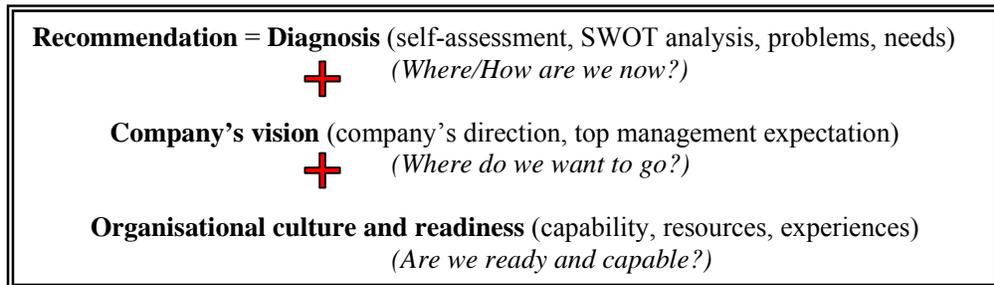
From 14 interviews with experts, current approaches to the selection of improvement initiatives could be divided into two main directions: a universal approach and a gap analysis approach. The universal approach is based on the expert's rule of thumb which is an approximate principle based on experience. Many experts suggest the adoption of QM and CI initiatives from easy to more difficult ones and laying the standard and awareness before implementing other advanced programmes. According to the interviews, common proposed steps are 1) basic activities of 5S, QCC, and suggestion system, 2) ISO9001, 3) TQM or Six Sigma, and 4) application for quality awards such as TQA (E1, E2, E3, E4, E6, E7, E8, E11, E12). This rule of thumb is suitable for a company which does not know where they are and have never experienced any initiative before (E6). Figure 6.3 illustrates the expert's rule of thumb for the adoption of QM and CI initiatives.



**Figure 6.3: The experts' rule of thumb for the adoption of initiatives**

While having the above rule-of-thumb, most experts understand that their recommendation depends on company needs, context, and situation at the time. The gap analysis approach is proposed, which follows a typical strategic decision-making process of identifying strengths and weaknesses of the company (where/how are we?) and matching them with the vision and expectation of top management (where do we want to go?) (E1, E2, E4, E5, E6, E7, E8, E10, E12, E13, E14). Moreover, additional studies of organisational culture and readiness in the company (e.g. experience with

quality tools, employees' capability) are conducted (E1, E2, E6, E14). Many consultants suggest a business excellence framework such as TQA, EFQM, or MBNQA for self-assessment to diagnose company needs (E4, E5, E6, E12), while some use SWOT analysis (E10), or their own assessment model (E1, E8). Although the gap analysis approach has been followed, methods to prioritise the choices are neither clear nor structured and vary between one expert and another. Some of them base the decision on assessment scores (E1, E4, E10, E12, E14, A1.1), and many use their own judgement (E2, E4, E5, E7, E8, E14). Figure 6.4 illustrates the gap analysis approach summarised by experts.



**Figure 6.4: Gap analysis approach**

In summary, the two selection approaches of experts are a universal or a rule-of-thumb approach, which provides a rigid roadmap for the adoption of QM initiatives, and a gap analysis method which considers the company's context and needs at the time. Although the rule-of-thumb approach is simple, it does not consider the company's vision, needs, and readiness. Hence the gap analysis is more appropriate; this is also suggested in the literature and its considerations (strategic fit and organisation fit) are then incorporated into the selection framework to provide a recommended choice to a company.

### 6.3 FRAMEWORK DEVELOPED THROUGH CROSS-CASE ANALYSIS

In total, forty-seven interviewees expressed the chosen decision criteria for selecting improvement initiatives (i.e. the ones which they have used up to now) and the preferred decision criteria (i.e. the ones that they would like to use in the future). Their statements were coded and categorised into the four selection views of strategic fit, pay-off, organisation fit, and fashion. The author organised all coding and counted the frequency of criteria mentioned by interviewees utilising a Microsoft Excel spreadsheet.

Table 6.1 presents a summary of chosen and preferred criteria for the selection. Both chosen and preferred factors are inputs to the selection framework and provide sub-criteria for each selection view.

**Table 6.1: Summary of chosen and preferred decision criteria**

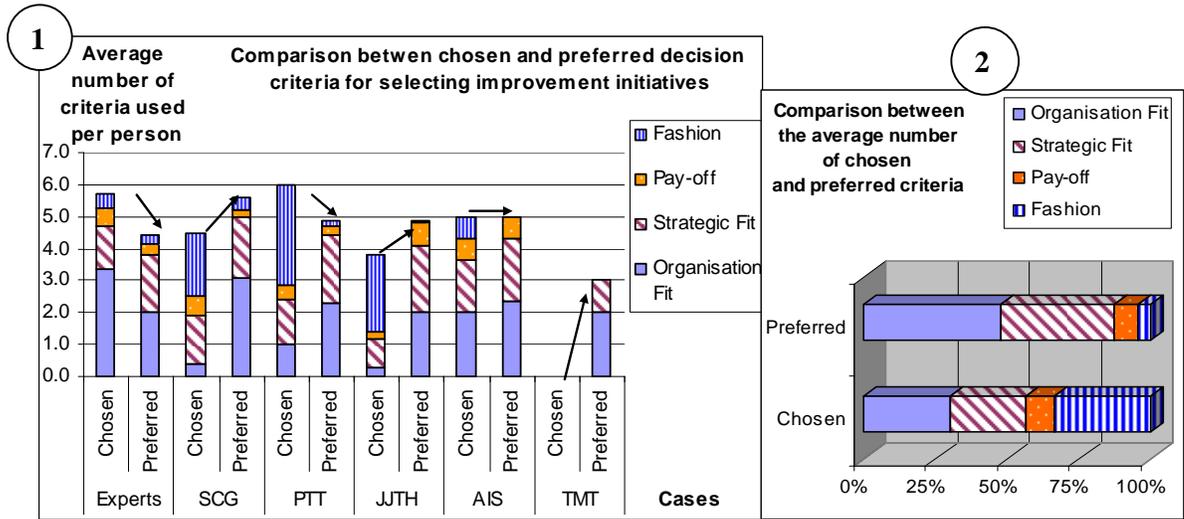
Selection views	Factors
<b>Strategic fit</b>	Company's needs, weaknesses, and expectations (requirement from customer, shareholder or stakeholder, government policy, and competitiveness)
	Responses and fit to company's direction, vision, and objectives
<b>Pay-off</b>	Benefits and effectiveness of the programme
<b>Organisation fit</b>	Company's capability and readiness
	- People's skill/education, attitude, belief, commitment, morale
	- Time, investment
	Achievement possibility
	National and organisational culture, nature of business, and organisation's structure
	Commitment from top management and support for the existing system
<b>Fashion setting</b>	Infrastructure (size and type of industry)
	Awareness of risk in change
	Follow best practice, competitor, book or journal article
	Suggested by consultant, expert in the field
	Follow trends

The Four selection views may be explained as follows:

- **Strategic fit** refers to the selection according to 1) company's direction, vision, business objectives and 2) needs and weaknesses.
- **Pay-off** refers to the selection based on benefits and effectiveness of the programme e.g. rate of return, benefits and cost ratio, and benefits from implementation
- **Organisation fit** refers to the consideration of the possibility of achievement, national and organisational culture, company's readiness (concerning people's education, capability, attitude, buy-in, commitment, morale, and previous lessons learnt), infrastructure (size and type of industry), and awareness of risk.
- **Fashion setting** refers to the selection which follows 1) best practice, competitors, books or journal articles, 2) suggestions from consultants and experts in the field, and 3) fashionable initiatives.

After the contents of the selection criteria were set, the author conducted a further analysis by comparing the number of mentioned chosen criteria to the preferred ones and separated them by each case company and experts group in order to see the similarities and differences across the cases. The cross-case pattern attempts to analyse interview data in a variety of ways in order to improve the likelihood of producing an accurate and reliable theory (Yin 2003). Figure 6.5 illustrates the average number of

criteria used per person in each case and a comparison between chosen and preferred criteria.



**Figure 6.5: Comparison between chosen and preferred criteria for selecting improvement initiatives**

The first graph shows that all four selection views were addressed in every case except the TMT, whose adopted programme was initiated and ordered by the corporate company. This graph confirms that these four criteria for selecting the programmes are relevant and indicates that each company and expert put different emphases on different criteria. Moreover, it shows that experts are more aware of the fitness to organisation including achievement feasibility, capability and readiness of the company in the current selection decision than others. Four companies (SCG, PTT, JJTH, and AIS) reveal that at present they do not have a structured methodology for selecting initiatives and that the recommendations from books, best practice, and consultants (fashion setting) strongly influenced their choice.

The second graph shows the degree of emphasis and the comparison between chosen and preferred criteria. The graph shows that fashion setting (recommendation by books, best practice, and consultants) is the most frequently mentioned current criterion, at 34 percent, followed by organisation fit (30 percent), strategic fit (26 percent), and pay-offs (10 percent). However, the interviewees suggested that more consideration should be given to the organisation fit (47 percent), and strategic fit (40 percent), while the attention to pay-offs (8 percent) and fashion (5 percent) decreased. This change in the number of criteria indicates the importance of organisation fit and strategic fit as major

considerations for the selection. Moreover, both graphs display the shift of current criteria from heavily fashion-oriented to organisation fit, strategic fit, and pay-off in the suggested ones, particularly for the PTT and JJTH cases. According to the information given by interviewees, frequently mentioned sub-criteria for the selection are listed in Table 6.2 .

**Table 6.2: Highly mentioned sub-criteria**

Selection View	Sub-criteria	Numbers of interviewees (46)	
		Chosen criteria	Preferred criteria
Strategic fit	Response to needs and weaknesses	20	43
	Top Management Expectation (Company's Vision/ Direction/Policy)	19	39
Organisation fit	Achievement Possibility	15	26
	Organisation's Culture, National culture	10	9
	Capability and readiness of the company	10	39
Pay-off	Benefits and effectiveness of the program	11	16
Fashion	Recommended by books/ journal articles	14	-
	Recommended by best practices	13	7
	Recommended by consultants	12	3

Although a number of criteria were raised in the interviews, very few people conduct a rigorous evaluation for the selection decision e.g. evaluation process, methods, or tools. The way to prioritise these factors is by judgement and people choose the initiative which is closest to their lists of identified factors, or to the company's weak areas, or to the purpose of the change (E1, E6, C1.3, C1.6, P2.3, J2.5, J2.7). SCG took one year for the selection decision with three months studying various concepts, six months for evaluation, and the rest to identify organisational weaknesses (C1.1, C1.3, C1.6). JJTH took two months for evaluation based on investment and resources usage and one month to develop a roadmap (J2.5, J2.7) while PTT took three months to reach a decision (P2.2, P2.3).

### **6.3.1 Rating the importance of pay-offs**

This section describes the important benefits gained from the initiatives, and influential factors that may persuade the company to adopt one initiative over another (resource consumption, impact to organisation, critical success factors). The results show the degree of significance of categories of pay-offs (category 1-7) and factors (category 8-10) recommended by experts and managers. A total of 44 interviewees (13 experts, and 31 managers) rated each benefit and implication summarised from the literature study in Chapter Four against a four-point scale (Not significant =0, Significant but low =1,

Medium =2, and High=3). Appendix 31 shows the list of categories and sub-categories and the rating scores. Figure 6.6 illustrates the graphical results of 45 sub-categories and Figure 6.7 shows the average degree of importance of 10 categories.

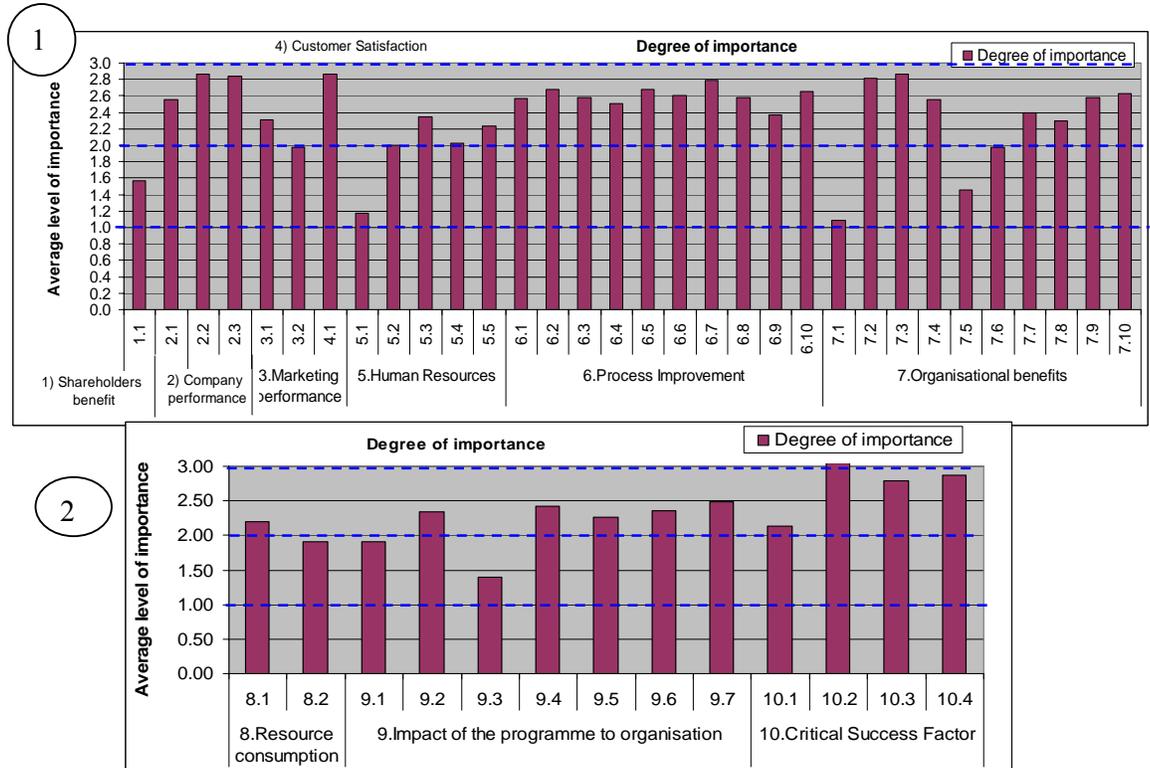


Figure 6.6: The importance of 45 sub-categories

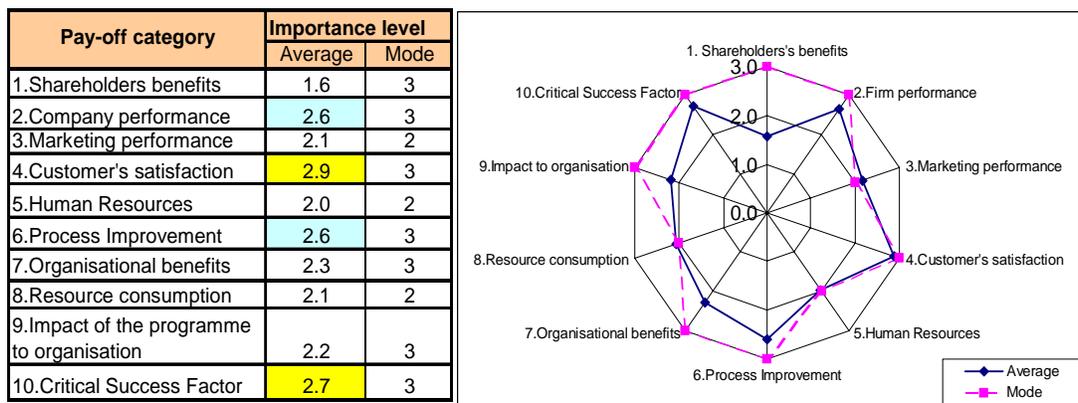


Figure 6.7: The importance of benefits and implications

Figure 6.6 shows that all categories are important for the selection and some benefits and implications are more important than others. Graphs 1 and 2 indicate that the sub-categories 7.1 (fashionable technique), 5.1 (reduce number of employees), 9.3 (do not improve the whole business), 1.1 (increase stockmarket price), and 7.5 (not interrupting

the operations) do not have much weight in the selection decision. Many interviewees said the stockmarket price as well as headcount reduction are not direct reasons to adopt QM and CI initiatives (E4, C1.7, J1.3, J2.3). The most important influential factors for the adoption of QM and CI programmes are as follows: top management commitment (10.2), effective team working (10.4), and expected benefits to improve customers' satisfaction (4.1), enhance quality performance (2.2), and build a foundation for continuous improvement (7.3). These rating results reveal that managers and experts expect that QM and CI initiatives should be effective in improving customers' satisfaction, company performance and process management. Moreover, obtaining top management commitment and effective teamwork are also significant factors in the adoption of these programmes.

#### **6.4 DEVELOPING THE THEORY OF SELECTION**

'Theory denotes a set of well-developed concepts related through statements of relationship, which together constitute an integrated framework that can be used to explain or predict phenomena.'

(Strauss & Corbin 1998, p.15)

The theory of selection is based on the previous results and analysis from the literature studies (in Chapter Four), the empirical case studies (in Chapter Five), and interviews with experts in this chapter. The author used the concept of open, axial, and selective coding to categorise the selection criteria and their sub-criteria, and to identify and integrate core categories into a theory of selection. Summarised from the interviews and case studies, the main decision criteria for selecting quality and improvement initiatives were grouped into four 'selection views': fashion setting, pay-off, strategic fit, and organisation fit. Table 6.3 provides a summary of the adopted initiatives from case studies and their selection criteria. It shows that these four criteria were repeatedly used to justify their reasons for adoption and that the emphasis was varied between cases and programmes. These four criteria are central categories to describe adoption paradigms, as they appeared frequently in the data, and were used and suggested by all empirical case studies. Additionally, the descriptions given by the four paradigms are logical and consistent.

**Table 6.3: Cases and the selection criteria**

How did they choose? What did the company adopt?		Selection criteria			
		Fashion	Pay-off	Strategic fit	Organisation fit
1. SCG	TQM	X	X	X	X
	ISO9001	X	X		X
	Deming Prize and TQA	X	X	X	X
2. PTT	5S, QCC, Suggestion system	X	X	X	X
	ISO9001		X	X	
	BPR	X	X	X	
	Six Sigma		X		
	Thailand Quality Award	X	X	X	X
3. JJTH	GMP		X	X	
	Process Excellence	X	X	X	
	Cost Improvement Program		X		
	Overall Equipment Effectiveness		X	X	
	Lean		X		
4. AIS	TQM	X	X	X	X
5. TMT	Toyota Production System, TQA		X	X	X
6. Experts	QM and CI initiatives	X	X	X	X

The adoption of improvement initiatives is described through a paradigm model referring to Strauss & Corbin (1998, p.127-136).

#### **6.4.1 Paradigm I: Fashion setting**

This fashion-setting paradigm represents a company's decision to adopt a programme according to suggestions from fashion setters – consulting firms, management gurus, business mass-media publications, and business schools. The company, as a fashion adopter, takes up the programme (phenomenon) because fashion setters create and disseminate improvement initiatives, and some of them (e.g. consultants) persuade and facilitate the implementation (causal condition). Existing fashion users, especially in developing and newly-industrialised countries, are keen to adopt new initiatives, continuously seek to obtain competitive differentiation through adoption, and follow fashion setters (contextual condition). Fashion setters who determine popular initiatives, longevity of the programme, and time lag in dissemination (intervening condition) induce the company to adopt new fashionable programmes according to their recommendations (action). This fashion setting leads organisations to change more frequently and raises the problem of initiative fatigue (consequence).

Although the adoption according to fashion is perceived as irrational and is denied as a reason by rational managers, fashion is actually an influential factor in the early stage of decision-making in many companies. SCG and AIS adopted TQM as suggested by Dr.

Kano. PTT has adopted many programmes recommended by best practice and experts. J&J implemented PE because Six Sigma and Lean showed high benefits at GE. Moreover, experts provide recommendations of widely accepted and new-trend programmes. Additionally, informal discussions with a manager and a researcher, who presented their research papers regarding the implementation of these improvement approaches at two leading OM conferences (POMS 2006 and EUROMA 2006), indeed reveal the influence of fashion setting and pay-off in the adoption.

David & Strang (2006) assert that ‘fashion consumers who decide to follow the management fashion are unlikely to make discriminating judgments about fashion suppliers.’ Adopting initiatives purely by the power of fashion setters, especially according to persuasive suggestions from consultants without having expertise in the area, is not recommended (Dvorak 2006; Miller & Hartwick, 2002; Gibson & Tesone, 2001). Empirical studies in this research accept the influence of fashion for adoption; however, the other three paradigms are regularly addressed to rationalise the selection decision. Many decision-makers (e.g. SCG, PTT) justify their fashion influence on the ground of improving customers’ satisfaction – a pay-off.

#### **6.4.2 *Paradigm II: Pay-Off***

The pay-off paradigm has a linkage with fashion-setting. It presents the company’s adoption of programmes according to the managers’ expectations of and desire for potential pay-offs (phenomenon). Fashion setters (particularly business mass-media publications and consultants) disseminate the programme and suggest the promised benefits attached to the initiative (causal condition). Their claimed pay-offs summarised from QM and CI literature in Chapter Four could be grouped into seven categories: shareholder, company performance, marketing performance, customer satisfaction, human resources, process improvement, and organisational impact. The importance of these categories as selection criteria was demonstrated in section 6.3.2. With the accessibility and availability of the claimed pay-offs (contextual condition), managers are able to seek a pay-off reason to justify their adoption (action). However, the credibility of the claimed pay-off (influential publication, empirical evidence, and consensus agreement on the claim) affects the quality of their selection decision (intervening condition). Hence, managers need more empirical evidence of pay-offs (action) to enhance their confidence in the decision-making (consequence). Moreover, a

greater number of empirical research studies on the effectiveness of the improvement initiatives is needed and the role of fashion setters is important to disseminate the claimed pay-offs (consequence).

Pay-off is an essential criterion for adoption. Empirical studies in this research (see Table 6.3) show that all companies and experts rationalise their adoption of all QM and CI initiatives according to the pay-offs. Indeed, there is a relationship between adopting new business ideas and perceived business performance (Staw & Epstein 2000). Therefore, companies believe that it is better to adopt new initiatives than to adopt nothing. However, there are some companies which disregard the waves of new management initiatives because the initiatives do not fit their company's objectives. According to the Chief Executive of A.T. Kearney, 'The reason why a firm does not surf in and out of management trends, e.g. TQM, is because TQM had never been a significant part of its business' (Dvorak 2006). This consideration for the adoption is called strategic-fit.

#### **6.4.3 *Paradigm III: Strategic fit***

The strategic fit paradigm describes the adoption considering the alignment of the improvement initiatives to a company's vision or objectives and/or a company's needs and weaknesses (phenomenon). In this paradigm, firms assess the improvement programmes in which they are interested against their objectives. The programmes which could maximise the company's prime goals show a higher degree of fit and tend to be adopted. The typical operational objectives such as cost, quality, speed, dependability, and flexibility (Slack *et al.* 2006) are frequently used to measure a company's performance. This strategic fit paradigm regularly occurs in a multi-national company and a conglomerate (contextual condition) where the corporate company sets a corporate policy or global guideline which emphasises the strategic direction of the firm and directs the selection decision (causal condition). For instance, the J&J Credo focuses on their responsibilities to customers, employees, community, and stockholders, while The Toyota Way sets the decision-making guideline to maximise outcome, aiming to deliver value to customers, shareholders, associates, business partners and the global community. Additionally, some of the adopted programmes are ordered as an obligatory company-wide implementation, such as the GMP and PE framework in J&J, TPS in Toyota, and TQM in SCG (causal condition). As a result the adopted initiatives

show higher alignment to the company's objectives and the results can be measured according to the performance objectives of the firm (consequence).

Nevertheless, a national subsidiary of a global company may have a specific need to implement its own programme e.g. JJTH needed a management platform for CI and created its own CIP programme. In addition, companies may adopt a programme which is fashionable in its location and country context, with the objective of gaining higher recognition in the local society (action) e.g. TMT applied for the Prime Minister Award and Thailand Quality Award, well-known awards in Thailand, and SCG obtained ISO9001 certification, an internationally-recognised standard, and was requested to apply for TQA (intervening condition). Therefore, the adopted programme may or may not maximise the company's competitive priorities since the justification for the adoption is not directly the company's objectives (consequences). Although the consideration of strategic fit is recommended, the concern of fit to company context highly influences the adoption decision in Thai organisations.

#### **6.4.4 *Paradigm IV: Organisation fit***

The organisation fit paradigm represents the adoption of initiatives according to the compatibility between the programme and the organisational context (phenomenon). To achieve organisation fit, the company assesses the initiative against the company's context such as company capability and readiness, national and organisational culture, achievement feasibility, and infrastructure. Thai organisations (e.g. SCG, PTT, AIS) and Thai experts in QM consider organisation fit as a major criterion for adoption (contextual condition) because they want to ensure a successful execution of the programme and avoid the risk of failure. Additionally, some companies (e.g. SCG, PTT) expect the adopted initiatives to build an organisational culture (causal conditions). The initiative may be adopted and adapted to suit and fit the organisation (action). If the adopted initiative does not match the organisation e.g. because it is against the culture, or there is a lack of resources (intervening condition), it will be deserted. As a result the adopted programme has less conflict in implementation and the company reduces the risk of change since it is more appropriate to the company context (consequence). Moreover, the programme is likely to be integrated into an organisational culture. Table 6.4 presents a summary of the four paradigms.

Table 6.4: A theory of selection

Selection views	Causal conditions	The adoption phenomenon	Contextual condition	Intervening condition	Action/ strategies	Consequences
Fashion settings	<p>Fashion setters (supply) create and disseminate new ideas and stimulate and persuade to facilitate implementation</p> <p><i>Properties of fashion setters:</i></p> <ul style="list-style-type: none"> <li>▪ Academics, consultants, gurus, experts, best practice</li> <li>▪ Various diffusion routes through publication (books, journal paper, magazine), talks and lecture</li> <li>▪ New trends</li> </ul>	<p>Company adopts management fashion</p> <p><i>Properties of fashion setting:</i></p> <p>Fashion setter (supply) Fashion users (demand)</p> <p><i>Dimension of adoption:</i></p> <ul style="list-style-type: none"> <li>▪ Partial adoption</li> <li>▪ Fully adopt throughout the whole organisation</li> </ul>	<p>Fashion users (demand) are:</p> <ul style="list-style-type: none"> <li>▪ keen to adopt new ideas</li> <li>▪ Continuously seek to obtain competitive differentiation through innovation</li> <li>▪ Perceive and believe in fashion setters</li> </ul>	<p>Fashion setters determine:</p> <ul style="list-style-type: none"> <li>▪ Fashion change</li> <li>▪ Longevity of the approach</li> <li>▪ Time lag in dissemination</li> </ul>	<ul style="list-style-type: none"> <li>▪ Adopt as many as possible</li> <li>▪ The adoption changes in relation to fashion setters</li> </ul>	<ul style="list-style-type: none"> <li>▪ Initiatives overload</li> <li>▪ Organisations change more frequently</li> </ul>
Pay-off	<p>Fashion setters suggest benefits as reasons for the adoption</p> <p><i>Properties of QM pay-offs</i></p> <ul style="list-style-type: none"> <li>▪ Shareholder</li> <li>▪ Company performance</li> <li>▪ Marketing performance</li> <li>▪ Customer Satisfaction</li> <li>▪ Human resources</li> <li>▪ Process Improvement</li> <li>▪ Organisational Impact</li> </ul>	<p>Company adopts the programme with a desire for the suggested and expected pay-offs</p> <p><i>Properties of expected pay-offs</i></p> <ul style="list-style-type: none"> <li>▪ Shareholder</li> <li>▪ Company performance</li> <li>▪ Marketing performance</li> <li>▪ Customer Satisfaction</li> <li>▪ Human resources</li> <li>▪ Process Improvement</li> <li>▪ Organisational Impact</li> </ul> <p><i>Dimension of adoption:</i></p> <ul style="list-style-type: none"> <li>▪ Partial adoption</li> <li>▪ Fully adopt throughout the whole organisation</li> </ul>	<p>Accessibility and availability of the claimed pay-offs</p> <p><i>Properties</i></p> <ul style="list-style-type: none"> <li>▪ Publication on effectiveness of the initiative</li> <li>▪ Talk presentations</li> </ul>	<p>Credibility of the claimed pay-off affects the quality of selection decision.</p> <p><i>Properties of the credible payoffs</i></p> <ul style="list-style-type: none"> <li>▪ Influential paper or strong publication (S)</li> <li>▪ Supported by empirical evidence (E)</li> <li>▪ Consensus agreement (C)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Seek for pay-off information</li> <li>▪ Need more empirical evidence of the claimed pay-offs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enhance confidence in the selection</li> <li>▪ More research on the programmes' effectiveness is needed</li> <li>▪ Role of fashion setters is necessary</li> </ul>

Selection views	Causal conditions	Phenomenon- Adopt QM approach(es)	Contextual condition	Intervening condition	Action/ strategies	Consequences
Business objective - strategic fit	<p>Company sets a corporate policy or directive guideline aiming at the company's objectives for the adoption</p> <p>Corporate company orders a mandatory programme.</p> <p><i>Properties:</i></p> <ul style="list-style-type: none"> <li>▪ Strategic global direction deployed from the corporate company e.g. J&amp;J Credo and The Toyota Way</li> </ul>	<p>Company select the programme based on the alignments of the initiatives to company's direction/ objectives or company's needs and weaknesses (Maximise company's goals)</p> <p><i>Properties of performance objectives:</i></p> <ul style="list-style-type: none"> <li>▪ Cost</li> <li>▪ Quality</li> <li>▪ Speed</li> <li>▪ Dependability</li> <li>▪ Flexibility</li> </ul> <p><i>Dimension</i></p> <ul style="list-style-type: none"> <li>▪ company-wide implementation</li> </ul>	<ul style="list-style-type: none"> <li>▪ A multi-national company</li> <li>▪ Conglomerates</li> </ul>	<ul style="list-style-type: none"> <li>▪ A specific need of a country company e.g. JJTH needs a management platform for CI; hence it created its own CIP programme</li> <li>▪ Adapt to the location and country context e.g. TMT applied for Prime Minister Award and Thailand Quality Award with the objective of being highly recognised in Thailand (fashion setting)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Company considers the corporate policy, guideline, and company's objective before the adoption</li> <li>▪ The company adopts the fashionable programme of its location</li> </ul>	<ul style="list-style-type: none"> <li>▪ The adopted programme aligns to company's direction</li> <li>▪ Outcome of the adoption can be quantified and measured according to the performance objectives.</li> </ul>
Organis-ation fit	<p>Experts or industrialists specifically consider successful implementation and avoid risk of failure</p> <p>Company adopt a programme with an aim to build an organisational culture</p>	<p>Company adopts the programme according to the compatibility between the initiative and organisational context</p> <p><i>Properties of organisation fit</i></p> <ul style="list-style-type: none"> <li>▪ Company capability and readiness</li> <li>▪ Achievement possibility</li> <li>▪ National and organisational culture</li> <li>▪ Infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>▪ Thai organisation and experts</li> <li>▪ Risk avoidance</li> </ul>	<p>Mismatch to organisation:</p> <ul style="list-style-type: none"> <li>▪ Against national/ organisational culture</li> <li>▪ Lack of resources</li> <li>▪ People attitude</li> <li>▪ Lack of top management commitment</li> </ul>	<p>Adopt and adapt to suit and fit in organisation</p> <p>Desert a mismatched programme</p>	<ul style="list-style-type: none"> <li>▪ Less conflict in implementation</li> <li>▪ Reduce risk of change</li> <li>▪ Integrate into an organisational culture</li> </ul>

The matrix shown in Figure 6.8 describes the characteristics of the four paradigms according to the causal condition for adoption and the transparency of the selection criteria. For the fashion and pay-off paradigms, fashion setters (external trigger) inspire the adoption. On the other hand, the considerations of organisation fit and strategic fit are motivated by the company’s insight and judgement (internal trigger). In terms of the transparency of reasoning, strategic fit and pay-off are explicit criteria<sup>3</sup> which can be measurable; however, organisation fit and fashion criteria are more abstract and the decision-makers use their tacit knowledge<sup>4</sup> to justify their selection. The selection decision can be based on all four paradigms, or the interactions between them.

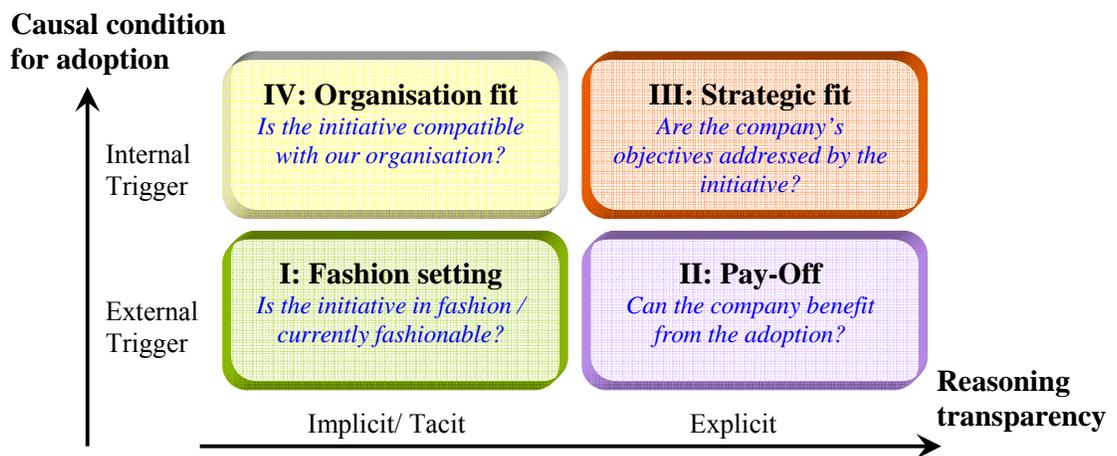


Figure 6.8: Four adoption paradigm

The CI selection framework shown in Figure 6.9 summarises key decision criteria grounded in existing theory and the empirical research in this study. One could add more sub-criteria to these lists but it is already more than enough to justify a rational selection. The next issue for the selection of QM and CI initiatives is to assess the degree of fit between the company’s priorities and the initiatives’ attributes. Chapter Seven incorporates this selection framework with a proposed MCDM method to assess the degree of fit between these two which provides support for the recommendation.

<sup>3</sup> ‘Explicit knowledge can be expressed in formal and systematic language and shared in the form of data, scientific formulae, specifications, and manuals.’ (Nonaka *et al.* 2002, p.43)

<sup>4</sup> Tacit knowledge is subjective, insights, intuitions and highly personal (Nonaka *et al.* 2002, p.43).

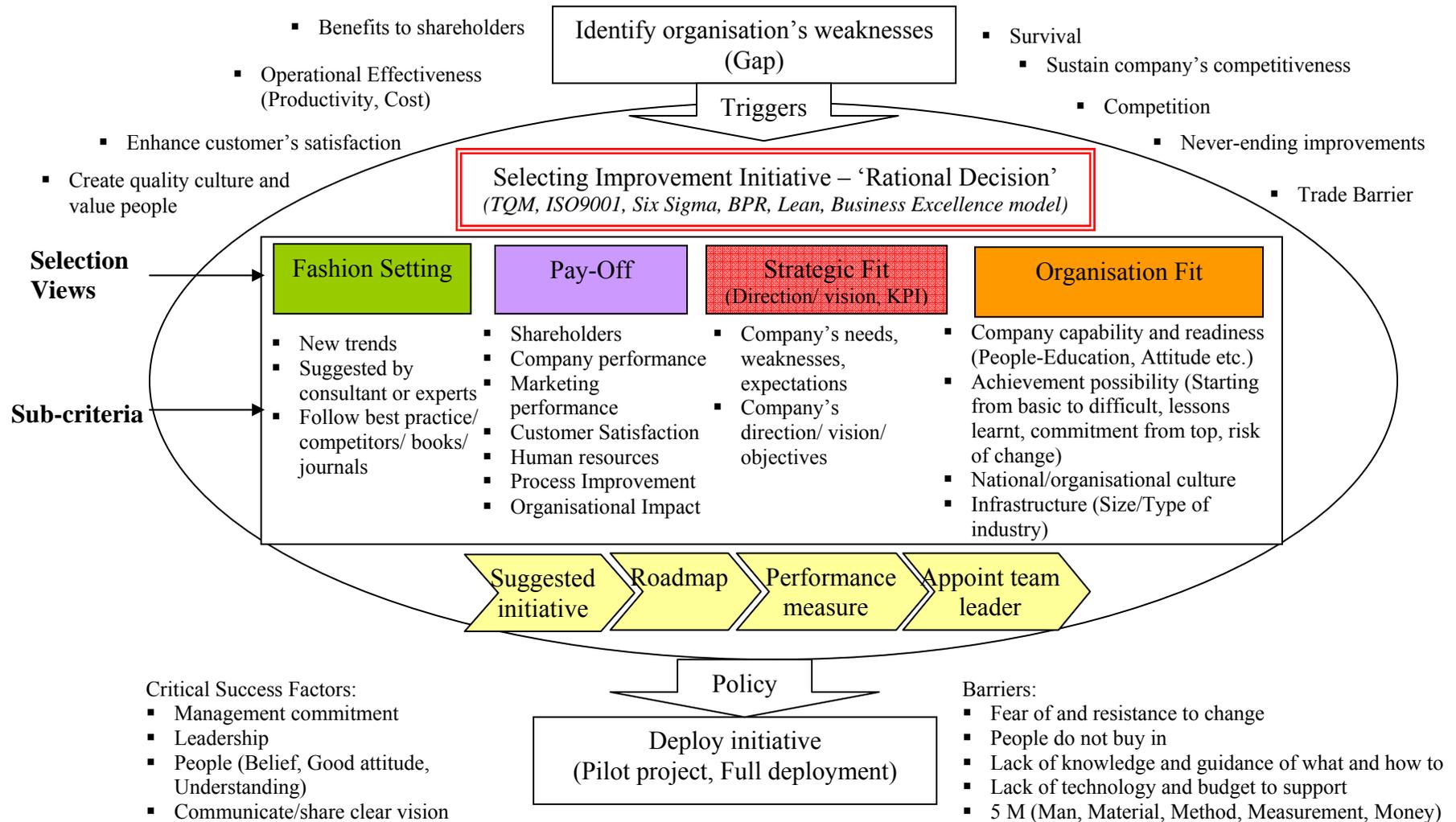


Figure 6.9: CI selection framework

## 6.5 AREAS ASSOCIATED WITH THE SELECTION PROCESS

There are three further areas of interest associated with the selection of initiatives: the way to effectively manage the adopted initiatives, key factors to sustain management ideas, and the overall picture of a management fashion supply chain.

### 6.5.1 *Effective management of the adopted initiatives*

The scope of QM and CI has been enlarged from a focus on quality alone to organisational improvement aiming at business excellence. There are two functions which are responsible for the adoption of QM and CI initiatives: the QM department (in charge of compliance with product and service quality) and organisational development/process excellence e.g. SCG, JJTH. However, some firms still maintain this duty in the QM department and extend its scope from quality and productivity improvement to business improvement (e.g. PTT, AIS, TMT). Many companies have gone through the CI journey and adopted a number of initiatives. Adopting too many initiatives at the same time leads to the problem of initiatives fatigue which confuses employees, raises a barrier to successful change, and may prevent delivery of the full potential of the programme.

To effectively manage adopted programmes, a company needs to integrate and combine similar activities, and set a management framework for all the adopted initiatives (e.g. SCG's house of TQM, J&J Process Excellence framework, AIS house of TQS, and Toyota house of QM). This core management framework will guide the improvement direction, effectively manage, and clarify the contribution of all initiatives to the business vision. The management framework of SCG, AIS, and TMT is depicted as a house of TQM. For SCG and AIS, TQM is their culture and a management framework. JJTH describes the adopted initiatives under its PE framework, and PTT adopted CI tools to construct its stairway. These five companies show the importance of the integration of previous and new improvement programmes into one solid framework. Such a framework will provide a consistent and transparent guideline for the adoption of initiatives in an organisation. Figure 6.10 illustrates the companies' QM management frameworks and Figure 6.11 depicts the recommended QM frameworks and the suggested series of adoption from experts.

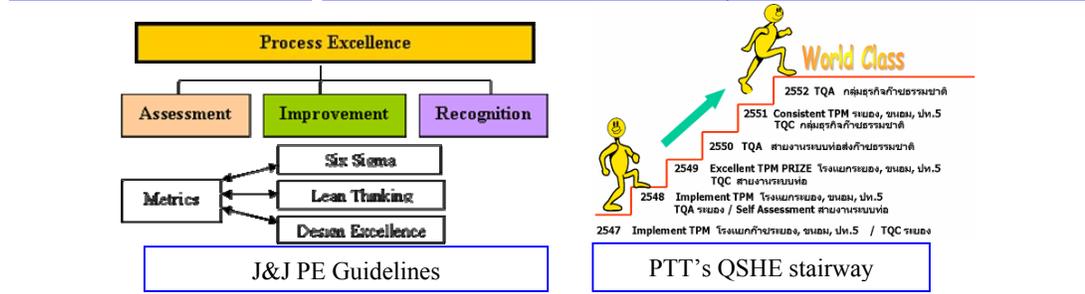


Figure 6.10: Companies' QM and CI frameworks

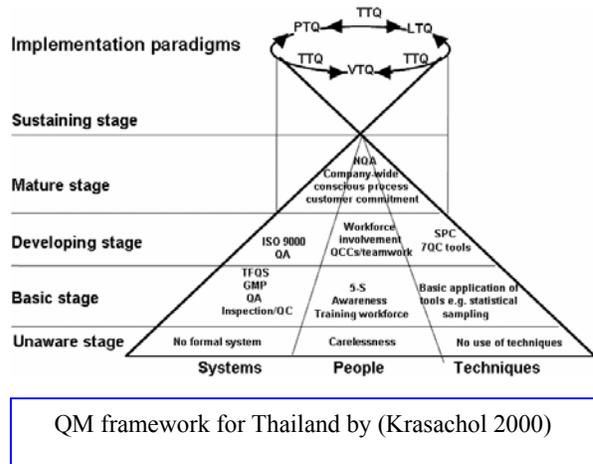
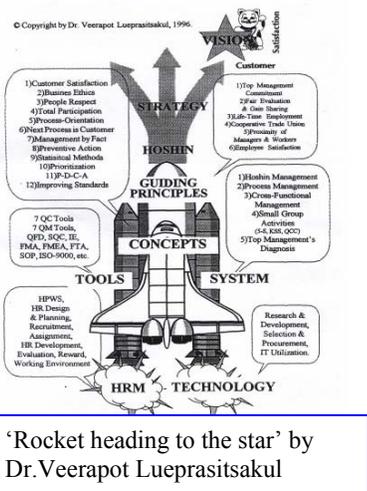
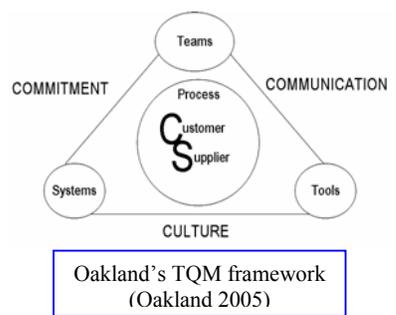
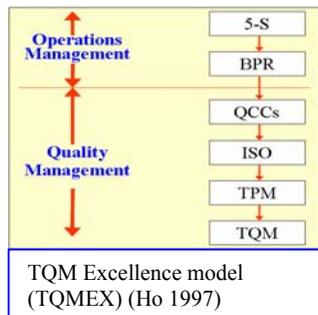


Figure 6.11: Experts' QM models

Additionally, some assumptions for the adoption of QM and CI initiatives are that: a company which already implements a foundation programme would not replace it with a second initiative which has similar concepts or contributes to similar pay-offs. However, a company can adopt other programmes as supplementary to the existing initiatives after the implementation of the previous ones has been completed. For instance, TQM-led companies would perceive Six Sigma as redundant. If Six Sigma is adopted, it will be located under a larger framework of TQM (SCG and PTT). Similarly in terms of the application for quality awards, once the company has been awarded a Deming prize, they will not apply for other awards with similar concepts and pay-off e.g. TQA, MBNQA, or EFQM (SCG).

### 6.5.2 *Key factors to sustain management fashions*

‘The change from management fad to fashion and to fit will not always take place. Some fads decline and are followed by newer and different fads. When there are many believers it might become a fashion; however it can lose its value if everyone is not committed to its use. Moving from fad to fit or fashion to fit will only occur when there is **strong internal motivation** and emotional involvement in implementation.’

(Van der Wiele *et al.* 2000)

From case studies, there are two sustainability factors for the adopted initiatives: immediate and long-term factors. The immediate factors are internal motivations and critical success factors which can prolong the adopted programmes in the short term. Six critical success factors, which were repeatedly mentioned in the context of SCG, PTT, and JJTH, are: (1) strong top management commitment, (2) positive employee attitude, (3) clear communication of obligatory practice through corporate policy or the company’s strategic direction, (4) rewards and recognition scheme, (5) perception of the needs or crisis, and (6) resource availability.

People are the key for success in CI implementation; as Dale (2003) said, ‘Winning the ‘hearts and minds’ of all employees and cultivating motivation and commitment amongst the workforce is and will remain a key issue for CI’. Surveys of employees’ attitude in the three case companies similarly show that both benefits to employees (daily work and self-improvement, and recognition scheme), and to the company (enhancing operation and business performance) are the primary reasons for their participation in CI activities. The other motivation factors are the attractive

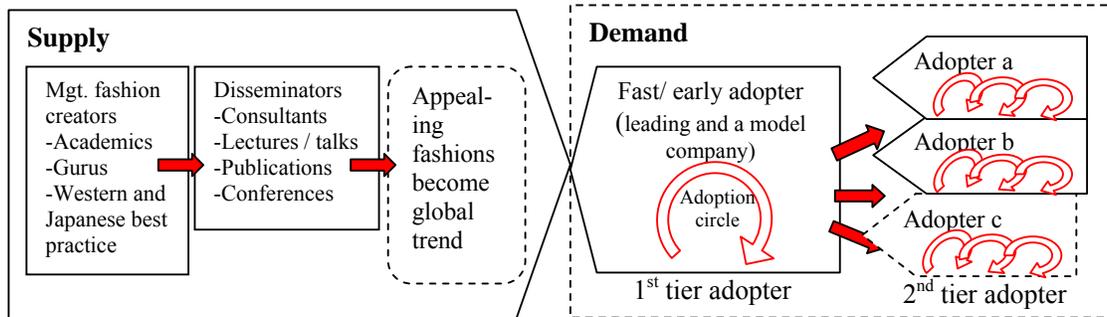
characteristics of CI activity (teamwork, frequent announcements, challenging tasks), and support from top management team. The hierarchy of motivation for CI activities (shown in Chapter Five) could be used to stimulate and manage people to participate in the improvement activities willingly.

The ability to integrate suitable initiatives into organisational culture is another long-term factor. The Southeast Asian Director of J&J said that the successful implementation of these improvement initiatives is the ability to ‘lead people singing the same song throughout an organisation’ (J1.1). In PTT, it is the ability to ‘instil QSHE activities into employees’ lifeblood’ (P1.1) while SCG regarded QM and CI as successful when ‘TQM becomes an organisational culture’. These three case companies similarly agreed that the improvement programmes are sustainable when they become part of an organisational culture. Both critical success factors and motivation factors can prolong the adopted initiatives in the short term; however, to have a long-term impact/to have long-term sustainability the initiative must be embedded into the organisational culture. Once the adopted initiatives fit an organisation and have influence on the organisational culture, they will be sustained. This aspect of adoption is called *an adoption of a sustainable management idea*.

### ***6.5.3 Management fashion’s supply chain***

A series of emerging initiatives and their popularity can be plotted into trends and fashions. A number of fashion developers, disseminators, and a number of adopters create the process chain of management fashion. Fashion creators and fashion adopters are the main players in this chain. In this chain, it is not the demand that solely drives suppliers; on the contrary, it is the power of suppliers which pushes the ideas forward. Some are successful and many are not. Unlike buying a tangible product, the adoption of ideas is neither fast nor easy to achieve. The cycle time of management fashion’s supply chain is counted in years while a production supply chain could be counted in hours or days. This long cycle time hides the phenomenon from operations managers. This section attempts to make explicit and explain the phenomenon of the management fashion supply chain based on literature and the empirical evidence of management trends in Chapter Four, and supported by five case companies in Thailand.

The management fashion supply chain comprises two main facets: supply (by management fashion suppliers who process knowledge creation and diffuse the ideas) and demand (by fashion users who can proceed from adoption to a sustainable organisational culture). Figure 6.12 portrays the 'chain of fashion' in a macro view.



**Figure 6.12: A macro view of management fashion supply chain (adapted from Abrahamson 1996)**

On the supply side, the life cycle of publications on management fashions (see Chapter Four) follows a similar pattern to the product life cycle (Introduction, Growth, Maturity, and Decline). However, a management fashion can be sustained by a new loop of invention and innovation of new management fashions which blend and hold or advance interest in the previous fashion. The development of management fashion can be divided into five stages: (1) basic knowledge, (2) creation/invention, (3) innovation, (4) diffusion and (5) persuasion (Roger 1995; Abrahamson 1996; Grant 2005; Greatbatch & Clark 2005). Invention is the creation of a new management fashion through the development of new knowledge or from new combinations of existing knowledge. Then some new management fashions progress into innovation where they are commercialised, packaged, and ready to be disseminated. The dissemination process is when the idea is initially brought to the attention of its intended audience; this can be done through publications, conferences, lectures, and presentations. To gain mass appeal, persuasion is the last process in the supply side where fashion setters (e.g. highly skilled and influential speakers - management gurus) are purveyors of management fashion, authors of best-selling books, and accomplished orators. The goals of this persuasive process are 'to enhance audience attentiveness, to maximise the likelihood of affiliate audience responses, and to make their messages arresting, memorable, and acceptable' (Greatbatch & Clark 2005).

On the demand side, the life cycles of the adopted management fashions may be different from those on the supply side (see Chapter Four). Time lags in dissemination of management fashions and their progress in adoption (continuation from fashion to fit and sustainable uptake) may influence company usage. The empirical case studies in Thailand show these effects. Once a leading company in Thailand such as SCG adopted new initiatives by following global trends and Japanese best practice (e.g. QC circle and TQM) and by applying for quality awards as requested by the Ministry of Industry, other companies in Thailand (AIS and PTT) followed as the second tier of fashion adopters. When the fashionable technique becomes boring and tiring, managers start searching for new tools to boost their CI activities, which then creates another cycle of fashion. If any of the adopters (either 1<sup>st</sup> tier or 2<sup>nd</sup> tier) is sensitive to fashion (i.e. it frequently takes up new initiatives and deserts the old ones), a bell-shaped curve of company usage may occur.

Nevertheless SCG, PTT, and JJTH attempt to sustain all the adopted programmes by improving and adapting, aligning and integrating those initiatives into an organisational culture. The Director of Corporate Total Quality Promotion Centre at SCG said ‘Many companies have brought in new management tools. *The use of these tools must be integrated.* Whatever we do, we should look at the long term.’ The planning manager and QM manager at the Cement Business of SCG also mentioned that:

‘The entire adopted programmes must be somehow related and linked. Once we could find their foundation, it is easy to do. TQM, TQA, MBNQA, BSC or ISO9000, by its real content is not separated but should be *adapted and integrated* to our own system. We must try to make it one subject; otherwise, this will cause a problem for our employees. Instead of *new initiatives coming again and again!* we must try to communicate that it is the same subject but in a different style e.g. format and emphasis may be different.’

The VP of QSHE at PTT similarly stated that ‘Tools can only help but at the end we must *align and embed them into our organisational culture.*’ The process of the management fashion supply chain in detail is shown in Figure 6.13.

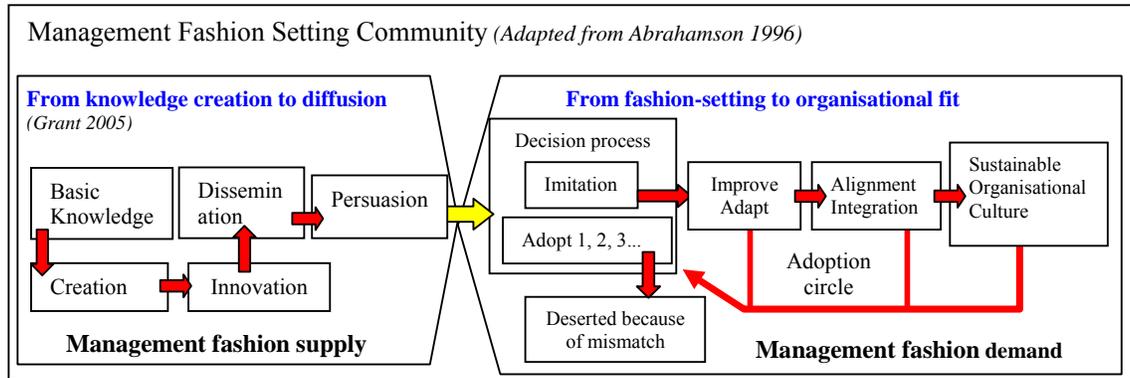


Figure 6.13: The process of management fashion supply chain

### 6.6 CONCLUSION

Both external influences such as a governmental push and trade barriers, and the internal need for improvements have triggered Thai companies for the adoption of QM and CI initiatives. TQM and ISO9001 have been well-liked concepts in Thailand as they are compatible with Thai culture and organisations, while Six Sigma and Lean are newly fashionable techniques, and BPR is a fad. Experts’ rule of thumb and gap analysis are current approaches to the recommendation of CI choice. The theory of selection and the preliminary selection framework were developed from cross-case analysis of the three in-depth case studies and interviews with experts. The selection criteria of fashion setting, pay-off, strategic fit, and organisation fit and their sub-criteria were revealed and incorporated into the selection framework. The theory of selection described the four adoption paradigms, which were repeated patterns of the selection criteria, and explained the adoption phenomenon, their conditions and consequences. In addition to the initiative selection, a quality management framework in a company was revealed as vital to the management and integration of all the adopted programmes, and to the communication of a company’s direction. To sustain QM and CI activities, the company needs both internal motivations and critical success factors for short-term support, and embedding of the adopted initiatives into an organisational culture for long-term sustenance. The framework developed in this chapter provides a comprehensive view of the selection decision which is used for the decision aid development in the following chapter.

## **CHAPTER 7. A PROPOSED DECISION AID FOR SELECTING IMPROVEMENT INITIATIVES**

‘For the successful research and application of MCDM methods, one needs both a deep understanding of the pure numerical properties of the methods involved, as well as the cognitive and behavioural aspects of the decision-making process.’

(Triantaphyllou 2000, p.264)

Chapter Six described the development of a selection framework and criteria to be considered in selecting improvement initiatives. However, the empirical case studies in Chapter Five show that all criteria are not equally important for each initiative and that the criteria are treated differently by different companies. Hence, this chapter presents the proposed decision aid for selecting improvement initiatives and provides the testing results of this decision aid with a multi-national company and a SME entrepreneur group. The decision aid was designed based on the process of strategic decision-making and employed the evaluating method of Multi-Criteria Decision-making (MCDM). This chapter begins with Section 7.1 which describes the expectations and desirable characteristics of a decision aid identified in the case studies and interviews. Section 7.2 briefly explains the scope and assumptions of the decision aid. Section 7.3 describes the selection framework and Section 7.4 explains the evaluating and selecting process. Section 7.5 gives a detailed description of the results in two test cases and discusses the feedback from the test cases which led to the refinement of the decision aid presented in Section 7.6. Finally, Section 7.7 presents the conclusion for this chapter.

### **7.1 EXPECTATIONS AND CHARACTERISTICS OF DECISION AIDS**

‘Decision-making involves choice, and choice requires both careful thought and much information. Excessive information can both overload and delay us. Many managers believe that making the right decision late is the same as making the wrong decision. Hence, we speed up the process by relying on judgement shortcuts called heuristics.’

Buchanan & Huczynski (2004, p.762)

The expectations and characteristics of decision aids have been identified in both the literature and empirical research. Current decision-making on which initiative to adopt tends to be made in heuristics where the decision is based on human intuition (see details in Chapter 2.3). This heuristics-based decision-making exploits the value of fast

and simple decision-making in order to reach a near-optimal solution but is exposed to biases (Buchanan & Huczynski 2004). The strategic decision-making and MCDA approach is introduced to enhance the rational decision and reduce such biases by providing a structured and systematic evaluation process aiming at the optimal decision. The desirable characteristics of a decision aid are simplicity, understandability, and usability (Dyer *et al.* 1992; Balakrishnan *et al.* 2007). To enhance utility, a spreadsheets-based system is proposed as a widely understandable and easy-to-use format (Dyer *et al.* 1992). In summary, the role of heuristics and the decision support system suggest that a decision aid should be easy-to-use, holistic, and structured aiming to reach the optimal solution. These characteristics were supported by the interviews. The author conducted interviews with 14 experts in quality management and 30 executives, senior managers, and Six Sigma master black belts from five Thai companies in order to gain an insight into their current decision-making approaches and their expectations for a decision support aid. A brief summary of the interviews is illustrated in Table 7.1.

**Table 7.1: Expectation and characteristics of a decision aid**

Selecting improvement initiatives	Quality experts (Academicians, consultants, experts) 14 interviewees	Industrialists (5 companies in Thailand) 30 interviewees
<b>Current practice</b>	<ul style="list-style-type: none"> <li>- Gap analysis</li> <li>- Implementation feasibility</li> <li>- Implement the initiative which was requested by the company</li> </ul>	<ul style="list-style-type: none"> <li>- No structured method for the selection</li> <li>- Frequently the decision came as a policy from top management team and consensus agreement</li> </ul>
<b>Who are the decision makers?</b>	Top management team, senior managers, and consultant(s)	Top management team and senior managers
<b>Weaknesses of the current practice</b>	<ul style="list-style-type: none"> <li>- Lack of clarity about importance of the programme to organisation</li> <li>- May miss important criteria</li> <li>- Subjective</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of clarity about importance of the programme to organisation</li> <li>- May miss important criteria</li> <li>- Too lengthy (varied from 2 months up to 1 year)</li> </ul>
<b>Importance of a structured decision support</b>	<ul style="list-style-type: none"> <li>- Enhance confidence in implementation</li> <li>- Right programme for the company's needs</li> <li>- Reduce complexity and increase transparency in decision making</li> <li>- Reduce time and cost in making the decision</li> </ul>	<ul style="list-style-type: none"> <li>- Right programme for the company's needs</li> <li>- Enhance confidence in implementation</li> <li>- Reduce time and complexity and increase transparency in decision-making</li> <li>- Provide supported reasons for the decision made and gain consensus agreement</li> </ul>
<b>Expectation of a decision aid</b>	<ul style="list-style-type: none"> <li>- To ease the decision making</li> <li>- Provide information e.g. benefits of each initiatives</li> <li>- Simple tools and guidance for decision making</li> <li>- Able to convince top management team</li> </ul>	<ul style="list-style-type: none"> <li>- To ease the decision making</li> <li>- Clear decision making process and evaluating method, simple tool and guideline</li> <li>- Provide information e.g. benefits and core concept of all initiatives, example of successful cases</li> <li>- Align with company direction</li> </ul>
<b>Characteristics of a decision aid</b>	<ul style="list-style-type: none"> <li>- Easy to use and understand</li> <li>- Customise to company's specific requirements</li> </ul>	<ul style="list-style-type: none"> <li>- Easy to use and understand</li> <li>- Link with company's objectives</li> <li>- Step-by-step approach</li> <li>- Customise to company's specific requirements</li> </ul>

From the interviews, it was found that the decision to select and adopt new initiatives usually came from the top management team and/or senior managers, who aim to foresee and adopt initiatives which best suit the company. The quality experts typically proposed that a methodology should be introduced based on a gap analysis and an assessment of implementation feasibility. However, no fully-structured process to select and evaluate improvement initiatives was identified in any of the interviews. Some experts and consultants suggested that a company should start by implementing an ‘easy’ methodology such as 5S and then ISO9001, followed later by TQM. Other consultants, perhaps strong believers in Six Sigma or Lean, aimed to persuade clients to adopt the methodology in which they have expertise.

Both experts and industrialists expressed the opinion that weaknesses in their current decision-making approach included: (1) lack of clarity about the importance of the methodology to the organisation, (2) important decision criteria may be missing and (3) the decision-making process is too lengthy. Interviews with industrialists showed that decisions concerning which methodology to adopt were typically taking between two months and a year. All interviewees perceived the value of adopting a structured process together with a decision aid, as it would help them to:-

- select the right methodology for the company’s needs,
- enhance confidence in implementation,
- reduce ambiguity of judgement,
- increase transparency in the decision, and finally
- it might reduce the time needed to select the methodology.

Interviewees expected a decision aid to be practical and easy to follow, to provide a step-by-step process and guidance on evaluation and decision-making. They recommended that the process should cover key, well-focused criteria for the selection, and align to a company’s priorities and context. They also suggested that information such as core concepts, a matrix of similarities and differences among methodologies, benefits gained and examples of successful case companies should be provided. Finally, the output of the decision aid should be credible and able to convince a top management team.

## 7.2 SCOPE AND ASSUMPTIONS OF THE DECISION AID

By following the principles of MCDA, the proposed decision aid and the selection criteria attempt to provide a directive process and a recommendation for the decision about which initiative to adopt, instead of a prescriptive approach. The decision aid assumed that managers' preferences can be represented by a utility function assigning a numerical value to each initiative and the most suitable programme would obtain a larger numerical value. More descriptions of MCDA foundation and its various methods can be found in Figueira *et al.* (2005), Triantaphyllou (2000), Bouyssou *et al.* (2006), and T'kindt & Billaut (2006). The decision aid for selecting improvement initiatives aims to analyse the decision-making context by identifying the effects of the initiative upon the criteria with which the managers are most concerned, organising and structuring the decision-making process, getting the managers to cooperate and gain consensus agreement, and finally elaborating recommendations using results taken from the model.

## 7.3 THE SELECTION FRAMEWORK AND DECISION AID

The proposed initiative selection framework aims to provide a holistic approach to the adoption process, based on the four selection views and their sub-criteria, which therefore must be considered in the evaluation process. Another purpose of this framework is to bring to the surface any irrational factors; make them explicit and situate them within a rational context to allow a more systematic and transparent evaluation. The process for selecting improvement methodologies draws on existing approaches in the fields of operations strategy and strategic decision-making. Approaches to manufacturing strategy formulation and implementation by Kim & Arnold (1996), Platts & Gregory (1990), Tan & Platts (2004), and the strategic decision-making process described by Harrison (1999) can be divided into three stages: identifying the strategic gap(s), setting objectives, and deploying the objectives. The proposed selection framework provides for similar stages. Figure 7.1 illustrates the framework.

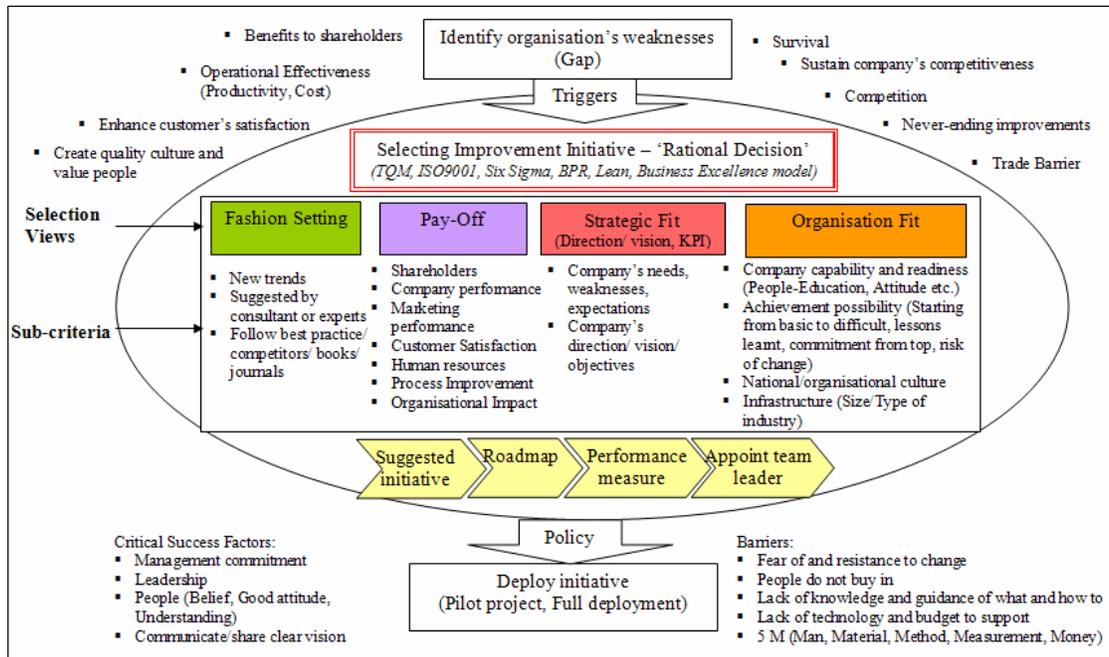


Figure 7.1: Improvement initiative selection framework

The 'triggers' for managers to adopt improvement initiatives will flow from strategic considerations, such as a classic SWOT (Strengths Weaknesses Opportunities Threats) analysis. Some typical triggers are suggested at the top of the diagram. Both internal and external issues may act as triggers; including sustaining competitiveness, enhancing customer satisfaction, and employee development. The central feature of the framework is the use of the four selection views (fashion setting, payoffs, strategic fit, and organisation fit) to provide the basis for a rational decision on the selection and evaluation of improvement initiatives. These selection views were developed both from the literature and from the in-depth interviews with experts and managers, as described in Chapter Six. Examples of typical sub-criteria or factors within each selection view are suggested. From effective consideration of these criteria, the most appropriate methodology will emerge. A roadmap for the adoption, performance measures for the selected methodology, and leadership issues should also be established. From these decisions, the deployment policy for the selected improvement methodology is created. Finally, the critical success factors and barriers to change are addressed to ensure a successful implementation.

In the context of the above framework, the proposed decision aid focuses primarily on structured decision-making within the selection element of the framework - the central oval shown in Figure 7.1. Instead of developing specialist software, the author chose to use Microsoft Excel spreadsheets for the decision modelling task, as this application is capable of modelling, well understood in business and commonly used in various practical situations (Balakrishnan *et al.* 2007; Dyer *et al.* 1992). The author developed user-friendly spreadsheets, with the necessary calculation functions incorporated. The decision-makers' task was merely to fill in input boxes on the spreadsheets with their weights and scores. Excel then produced the overall scores, ranking, and graphical outputs to aid the decision-making. Such pre-designed spreadsheets provide a quick response to the quantified preferences and reduce the time taken to evaluate the choice.

#### 7.4 PROCESS FOR EVALUATING AND SELECTING THE INITIATIVE

Based on the framework described above, detailed steps for evaluating and selecting the most appropriate methodology are explained in this section. The author developed a four step process (Figure 7.2) using the MCDM approaches (Daellenbach & McNickle 2005; Bazerman 2005; Balakrishnan *et al.* 2007) as a basis which provides a step-by-step and easy-to-follow procedure. The process is composed of (1) brainstorming and agreeing criteria, (2) weighting the criteria, (3) rating each improvement approach on each criterion, and (4) interpreting the results on the optimal decision and analysis.



Figure 7.2: Process for evaluating and selecting the initiative

##### 7.4.1 Initial briefing

Prior to the workshop, the facilitator briefed the participants by explaining the initiative selection framework and the stages in the selection process. The participating managers, acting as the decision-makers, were provided with the selection framework and a selection matrix form. Figure 7.3 shows the selection matrix form with weighting and importance guidelines superimposed. The facilitator also provided background

information about improvement approaches, including current trends in the adoption of various important methodologies and a payoff matrix which summarised the claimed benefits of each (described in Chapter Four). The objective of the workshop was ‘to select improvement approaches rationally, using a clear and systematic evaluation process’ - to be accomplished using the decision aid. The participants would decide the improvement programmes of their interest for selection. The choices comprise of six well-known initiatives: TQM, ISO9001, Lean, Six Sigma, BPR, and Business Excellence.

**Selection matrix of improvement initiative**

Company's name: \_\_\_\_\_, Date: \_\_\_\_\_

Type of industry: Manufacturing or Service, Type of product/ service: \_\_\_\_\_

					Rate initiatives											
Dimension of rationale decision	Area Weight	No	Sub-Criteria	Company's Importance	TQM	ISO		Lean	Six Sigma		BPR	Business Excellence				
					Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score		
Strategic Fit (Direction/ vision, KPI, OVI/OQ)	Sum = 1.00	1	Cost		0	0	0	0	0	0	0	0	0	0		
		2	Quality		0	0	0	0	0	0	0	0	0	0		
		3	Speed		0	0	0	0	0	0	0	0	0	0		
		4	Dependability		0	0	0	0	0	0	0	0	0	0		
		5	Flexibility		0	0	0	0	0	0	0	0	0	0		
Pay-Offs	Sum = 100	1	Shareholder benefits		0	0	0	0	0	0	0	0	0	0		
		2	Company performance		0	0	0	0	0	0	0	0	0	0		
		3	Marketing performance		0	0	0	0	0	0	0	0	0	0		
		4	Customer satisfaction		0	0	0	0	0	0	0	0	0	0		
		5	Human resources		0	0	0	0	0	0	0	0	0	0		
		6	Process improvement		0	0	0	0	0	0	0	0	0	0		
		7	Organisational benefits		0	0	0	0	0	0	0	0	0	0		
Organisation Fit (Ensure successfulness in implementation)	Sum = 100	1	Company capability and readiness		0	0	0	0	0	0	0	0	0	0		
		2	Achievement possibility		0	0	0	0	0	0	0	0	0	0		
		3	National and organisational culture		0	0	0	0	0	0	0	0	0	0		
		4	Commitment from top		0	0	0	0	0	0	0	0	0	0		
		5	Infrastructure		0	0	0	0	0	0	0	0	0	0		
Fashion	Sum = 100	1	Follow best practices, competitors, books, journal suggested by consultants, experts		0	0	0	0	0	0	0	0	0	0		
		2			0	0	0	0	0	0	0	0	0	0		
		3	Follow fashions		0	0	0	0	0	0	0	0	0	0		
EVALUATION					0	0	0	0	0	0	0	0	0			
Strategic fit score					0	0	0	0	0	0	0	0	0			
Pay-offs score					0	0	0	0	0	0	0	0	0			
Organisation fit score					0	0	0	0	0	0	0	0	0			
Fashion score					0	0	0	0	0	0	0	0	0			
Overall score					0	0	0	0	0	0	0	0	0			
Rank					1	1	1	1	1	1	1	1	1			

Score 1 - 5

Area weight	0-1.00	Total = 1.00
Sub-criteria weight according to company's importance	0-100	Total = 100
Rating Score	1-5	1 = Very low to 5 = Very high (See Proforma for rating)

Figure 7.3: A selection matrix form

7.4.2 Step 1: Brainstorming and agreeing upon the sub-criteria

During this step, managers from each plant conducted a brainstorming session and agreed upon the sub-criteria under each selection view. A rating pro forma which described the meaning of each rating score for the choice was provided and also agreed by the participants as shown in Figure 7.4. To select the improvement methodology, two levels of criteria were considered. The first level used the four main selection views

or dimensions, shown in the left column in Figure 7.3. The second level was composed of sub-criteria for each selection view, for example the sub-criteria of strategic fit were cost, quality, speed, dependability, and flexibility. The managers were first required to consider and agree upon the criteria and sub-criteria they wished to use, to select their improvement approaches. After consensus agreement is reached, the next step is to give weight to each of the agreed criteria.

Dimension of rationale decision	No	Sub-Criteria	Ratings Description						
			1	2	3	4	5	0	
<b>Strategic Fit</b> (Direction/ vision, KPI, OW/OQ)	1	Cost	Low achievement in cost	====>				High achievement in cost	Don't know
	2	Quality	Low achievement in Quality	====>				High achievement in Quality	Don't know
	3	Speed	Low achievement in Speed	====>				High achievement in Speed	Don't know
	4	Dependability	Low achievement in Dependability	====>				High achievement in Dependability	Don't know
	5	Flexibility	Low achievement in Flexibility	====>				High achievement in Flexibility	Don't know
<b>Pay-Offs</b> (Company's needs, and Others which are not linked to strategy)	1	Shareholder benefits	Low benefit to shareholder (stockmarket price)	====>				High benefit to shareholder	Don't know
	2	Company performance	Low benefit to company's performance (profit, cost, quality, productivity)	====>				High benefit to company's performance	Don't know
	3	Marketing performance	Low benefit to marketing performance (marketshare, brand recognition, international standard for quality management system)	====>				High benefit to marketing performance	Don't know
	4	Customer satisfaction	Low benefit to customer satisfaction	====>				High benefit to customer satisfaction	Don't know
	5	Human resources	Low benefit to human resources (reduce number of employees and resource usage, increase employees' skill, provide rewards and recognition)	====>				High benefit to human resources	Don't know
	6	Process improvement	Low benefit to process improvement (process innovation breakthrough, reduce process variation, provide improvement methods and tools, promote procedural and standardised work, improve workflow and reduce waste, create fast, flexible and accessible information, improve inventory management)	====>				High benefit to process improvement	Don't know
	7	Organisational benefits	Low benefit to organisation (Competitiveness, foundation for continuous improvement, agile and learning organisation, motivate intensive training, improve organisational culture, identify company's weaknesses, motivate quality awareness)	====>				High benefit to organisation	Don't know
<b>Organisation Fit</b>	1	Company capability and readiness	Lack of capability and readiness in our company	====>				High capability and readiness in our company	Don't know
	2	Achievement possibility	Low achievement possibility and high risk of change	====>				High achievement possibility and low risk of change	Don't know
	3	national and organisational culture	Not suitable to our national and organisational culture	====>				Highly suitable to our national and organisational culture	Don't know
	4	Commitment from top	Lack of commitment from our top management	====>				Full commitment from our top management	Don't know
	5	Infrastructure	Not suitable to our size and type of industry	====>				Highly suitable to our size and type of industry	Don't know
<b>Fashion</b>	1	Follow best practices, competitors, books, journal	No/ Low persuasion and recommendation from best practices, competitors, books, and journal articles	====>				High persuasion and recommendation from best practices, competitors, books, and journal articles	Don't know
	2	suggested by consultant, experts	Not suggested by consultant and experts	====>				Highly suggested by consultant and experts	Don't know
	3	Follow fashions	Not in fashion at the moment	====>				Highly in fashion	Don't know

Figure 7.4: Pro forma for rating

7.4.3 Step 2: Weighting the selection view and decision criteria

This step, often described as elicitation of the weighting criteria, was the most important stage of the evaluation process. The weights assigned to the selection criteria attempt to reflect the importance of each criterion, with the highest values considered to be the most critical criteria. Point allocation was employed as it is easy to use and high trustworthy (Cáñez 2000; Srivastava 1995). When using point allocation, a participant would allocate up to 100 points, or alternatively a number between zero and one, among a set of criteria. To avoid confusion between the selection views and their sub-criteria, the 100 points were applied to the sub-criteria and the number between zero and one was used to weight the selection view. The summation of weights over the four

selection views must add up to one and there must be a total of 100 in each selection view. The managers fill in the given weight in the form provided (in Figure 7.3) once a consensus agreement of the weighting decision has been reached.

#### **7.4.4 Step 3: Rating and ranking**

The rating step is intended to measure how well decision-makers believe the various improvement methodologies will achieve each of the defined criteria. The decision-makers are required to assess the potential consequences of each improvement approach, for each of the identified criteria. Five-point Likert scales were employed to rate each of the criteria as they are a simple, effective and widely used method for this purpose (Spector 1992; Robson 2002; Yoon & Hwang 1995). The five-point scale was credited with scores of 1,2,3,4,5 which can be described as very unfavourable, unfavourable, neutral, favourable, and very favourable. A score of zero was assigned to any criterion when a decision-maker considered that there was insufficient information to make the rating decision. This step concentrates on discussing the managers' views on the scores, reviewing the evidence provided, and finally gaining a consensus agreement upon the final ratings.

After generating the weightings and the ratings, the weighted scores were calculated and the ranking were displayed using the pre-designed Microsoft Excel spreadsheet to facilitate the calculation. The Weighted Sum Method (WSM) was chosen to evaluate the preferred selection based on the criteria scores and weights. The WSM was chosen for simplicity, as the accepted standard, and for its practicality (Daellenbach & McNickle 2005). Firstly, the WSM is simple, which will reduce the evaluation time and provide a clear and understandable calculation method to managers. Secondly, it is a widely accepted standard method for MCDM problems. Thirdly, it is popular with practitioners for rational decision-making, and this decision aid aims to address its practicality. According to the WSM, which is based on the additive utility assumption, the total value of each alternative is equal to the sum of the weighted ratings (Triantaphyllou 2000). The score  $T_j(t)$  in the  $j^{\text{th}}$  selection view for methodology  $t$ , was determined (Eqn. 1) by summing the product of the each sub-criterion rating (score  $S_{j,i}^t$ ) and its relative weight ( $W_i$ ). The overall score for methodology  $t$  could then be

evaluated similarly, by weighting and summing all the selection view rating scores to give the total weighted score (Eqn. 2). Hence:

$$T_j(t) = \sum_{i=1}^n W_i S_{j,i}^t \quad \text{Eqn. (1)}$$

$$\text{The overall weighted score (t)} = \sum_{j=1}^m V_j T_j(t) \quad \text{Eqn. (2)}$$

$T_j(t)$  = total score of the  $j^{\text{th}}$  selection view for the methodology  $t$

$W_i$  = relative weight or importance of the  $i^{\text{th}}$  sub-criteria

$S_{j,i}^t$ ,  $i$  = rating score of the  $i^{\text{th}}$  sub-criterion for the  $j^{\text{th}}$  selection view

$n$  = number of sub-criteria in the  $j^{\text{th}}$  selection view

$V_j$  = relative weight of the  $j^{\text{th}}$  selection view

$m$  = number of selection views

The preferred improvement initiative is the one that has the maximum overall weighted score. The improvement initiatives may then be ranked in order of preference from the highest to the lowest overall score. An example of the calculation is described in two steps as follows.

*a) Total score of a selection view*

The weighted score of each sub-criterion was calculated by multiplying the weight by the score (e.g.  $W_i \times S_{j,i}^t$ ). The total weighted score is the summation of all weighted scores in a selection view.

Sub-Criteria	Company's Importance Weight ( $W_i$ )	Score ( $S_{j,i}^t$ )	Weighted Score $W_i \times S_{j,i}^t$
Cost	30	4	120
Quality	30	3	90
Speed	20	4	80
Dependability	10	3	30
Flexibility	10	4	40
<b>Total strategic fit</b>	<b>100</b>		<b>360</b>

$T(t) = \sum W_i S_{j,i}^t$

**Figure 7.5: Example of the calculation for total score of a selection view**

*b) The overall weighted score or the final score of an initiative*

The overall weighted score or the final score of an initiative was calculated by multiplying the total score from previous step by the weight of the selection view and adding them up.

Selection views	Weight (Vj)	Total score (Tj)	Vj Tj(t)
Strategic fit	0.20	360	72.0
Pay-offs	0.40	205	82.0
Organisation fit	0.30	345	103.5
Fashion	0.10	340	34.0
<b>The overall weight score</b>			<b>291.5</b> $\sum V_j T_j(t)$

Figure 7.6: Example of the calculation for the overall score of an initiative

The initiatives are then ranked according to the final score of each initiative. The highest score indicates the overall best alternative. However, this score and ranking is used as the basis for further discussion rather than a final answer.

**7.4.5 Step 4: Result and analysis**

This final step of interpreting the WSM results and presenting the decision-makers’ preferences using suitable graphical and tabular methods is necessary for an effective decision aid. The results analysis for selecting improvement initiatives therefore used both matrix diagrams and a performance profile graph. The evaluation matrix diagram (shown in

Figure 7.3) was used to assist decision-makers to agree their order of preference (Daellenbach & McNickle 2005). The spreadsheet template was designed to facilitate this task, allowing decision-makers to see the overall evaluation and re-evaluate their weights and scores if desired. The performance profile of improvement methodologies is shown by a selection matrix table and graph (Figure 7.7). The graphs provide a visual comparison between methodologies in terms of the selection views and their sub-criteria. These graphs provide a transparent visual interpretation that should have credibility with senior managers, and also form a record of the decision-making process.

	Area Weight	Selection views	Total weighted score			
			TQM	ISO9001	Lean	Six Sigma
EVALUATION	0.35	Strategic fit score	365	330	350	415
	0.35	Pay-offs score	360	240	180	410
	0.20	Organisation fit score	370	310	310	330
	0.10	Fashion score	250	0	400	300
		<b>Overall score</b>	<b>353</b>	<b>262</b>	<b>288</b>	<b>385</b>
	Rank	2	4	3	<b>1</b>	

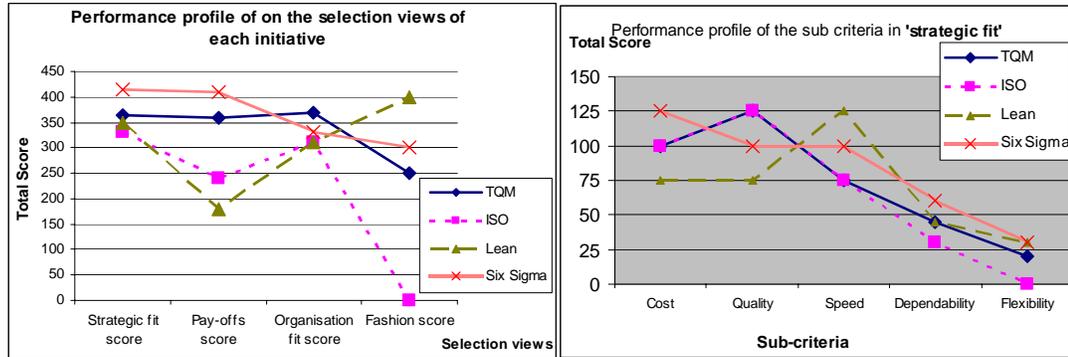


Figure 7.7: The performance profile table and graphs

### 7.5 TESTING AND REFINING THE SELECTION PROCESS

In the testing phase, the proposed decision aid outlined above was empirically tested in two workshops. The objective of the workshop was to test the feasibility of the decision aid and identify areas for refinement. The author and an experienced local consultant acted as facilitators to guide and structure the process. The facilitators limited their guidance to the decision support process and did not attempt to influence the workshop participants' views. After the workshop the participating managers were provided with a questionnaire in order to feed back their assessment of the decision aid. The three criteria for assessment were: feasibility, usability and utility (Platts 1993). The first workshop was carried out with four groups of decision-makers from four different manufacturing plants of a multi-national company. The second one was conducted with seventeen SME entrepreneurs. Both workshops lasted three hours. Results and analysis from the workshop are discussed below. The feedback obtained from the assessment questionnaires (regarding feasibility, utility and usability), discussions with the participants, and reflections from observations indicate the robustness of the decision aid and identify areas for refinement.

#### 7.5.1 Workshop with a multinational company- Essilor



Essilor is a French-owned multi-national manufacturing company specialising in optical lens production. Its operations in the Asia-Pacific region have an annual turnover of US \$120 million. Its manufacturing plants in Asia are located in Thailand, the Philippines, India, and China, with 4,000 employees in total. The company implemented ISO9001 several years ago, due to customer demand and competitive pressures. Six Sigma and

Lean approaches have been implemented throughout the Asia-Pacific plants since 2003 with objectives of cost reduction, improved customer satisfaction, and reduced inventory. The use of the EFQM excellence model is now being studied. Decisions on what methodologies to adopt are made by the top management team, assisted by a business process improvement leader. In an interview with the author, a Six Sigma Master Black belt (MBB) from the Asia-Pacific region explained that the adoption of Six Sigma was triggered by top management in Europe who called meetings and persuaded local top management of the benefits and cost savings, over a period of two months. At that time the company did not have any selection mechanism, hence the decision was made by reviewing global trends (using internet searches) and comparing consultancy fees with the company's budget. The interviewee expressed positive interest in this research and in a practical decision aid for selecting future improvement initiatives. Consequently, a workshop was arranged by the author, assisted by an expert facilitator, working with 13 managers and engineers from four plants in China, India, Thailand, and the Philippines. The participants were divided into four groups, according to their countries of origin. Figure 7.8 illustrates the four groups of decision-makers from the Essilor manufacturing group.



**China Plant (Shanghai)**



**India Plant**

**Philippines Plant****Thailand Plant****Figure 7.8: Four groups of decision-makers from Essilor**

### **Results and analysis**

The participants decide to select from among four well-known initiatives: TQM, ISO9001, Lean, and Six Sigma, considering their own plant. The decision-makers from all four plants agreed to use all four selection views and their sub-criteria. As one of the managers said, ‘Wide ranges of criteria and sub-criteria in the framework have covered all the important factors and the framework provides a good quick overview of how to select the initiative.’ After discussion, consensus agreement on the relative weight of each criterion and sub-criterion was reached in each team. This step seemed easy for all participants and it did not take a long time for them to reach an agreement. The weighted criteria from three of the plants were similarly, showing that pay-offs or the benefits gained from implementing the initiative appealed to them as the most important selection view, followed by alignment to the company’s objectives, fitness to organisation, and small weight was given to fashion. The team from the China plant put more importance on operational objectives than payoffs but both factors were perceived as more important than the other two. Figure 7.9 shows the relative importance of the four selection views.

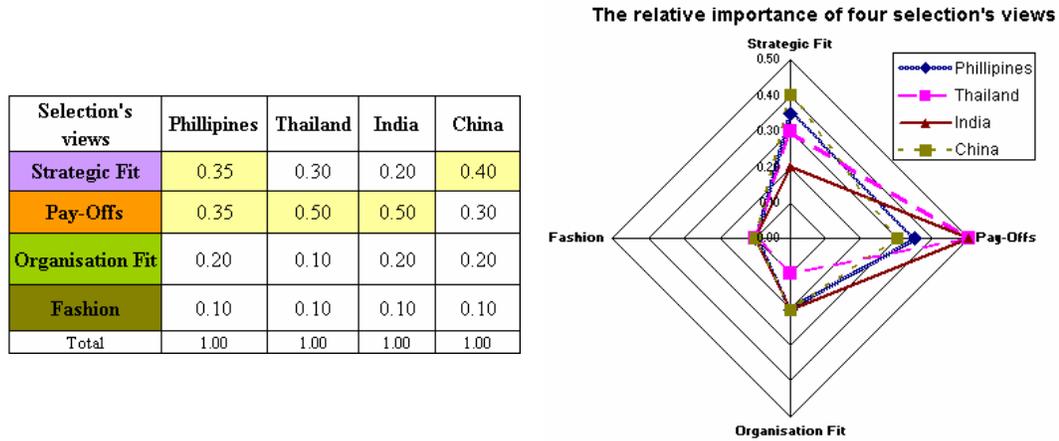


Figure 7.9: The relative importance of the four selection views in Essilor

The relative weights of the sub-criteria also varied between the manufacturing plants. This suggests that the different plant had distinct sets of objectives and concerns, although some similar emphases could be observed. The results from the four plants showed that cost and quality objectives were given high weighting, as well as the expected benefits of increased customer satisfaction. Moreover, commitment from the top management team and the adoption of best practice were strong influences on the adoption of the methodology in all teams.

After all the weights were allocated, the managers rated each initiative upon each defined criterion. It took almost an hour to evaluate and rate all the initiatives, as all four initiatives need to be assessed upon all 20 sub-criteria. The overall results and performance profiles from Essilor’s Philippines plant are illustrated as an example in Figure 7.10 and Figure 7.11. The results and analysis from China, Thailand, and India are illustrated in Appendix 32, 33 and 34 respectively.

**Selection matrix of management tools**

Company's name: .....Essilor Manufacturing (Philippines)

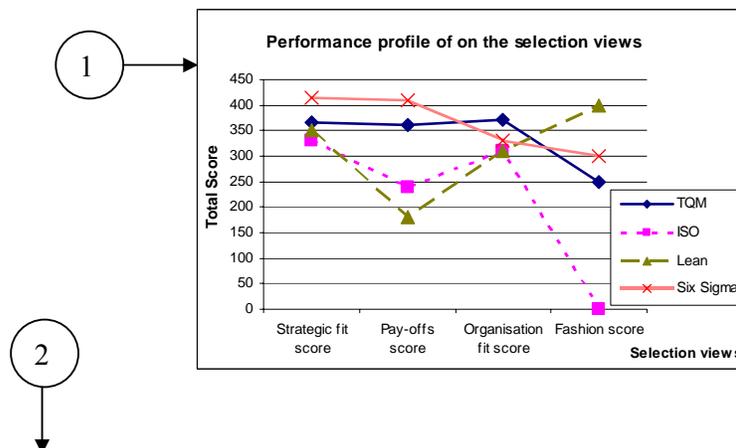
Date:....30 March 2006.....

Type of industry: Manufacturing or Service, Type of product/ service:....Contact Lenses.....

Selection's views	Area Weight	No.	Sub-Criteria	Company's Importance	Rate Initiatives							
					TQM		ISO		Lean		Six Sigma	
					Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Strategic Fit (Direction/ vision, KPI, OW/OQ)	0.35	1	Cost	25	4	100	4	100	3	75	5	125
		2	Quality	25	5	125	5	125	3	75	4	100
		3	Speed	25	3	75	3	75	5	125	4	100
		4	Dependability	15	3	45	2	30	3	45	4	60
		5	Flexibility	10	2	20	0	0	3	30	3	30
Pay-Offs	0.35	1	Shareholder benefits	10	0	0	0	0	1	10	5	50
		2	Company performance	10	4	40	0	0	3	30	4	40
		3	Marketing performance	10	1	10	0	0	1	10	2	20
		4	Customer satisfaction	40	5	200	5	200	1	40	5	200
		5	Human resources	10	3	30	0	0	1	10	3	30
		6	Process improvement	10	4	40	4	40	4	40	5	50
		7	Organisational benefits	10	4	40	0	0	4	40	2	20
Organisation Fit	0.20	1	Company capability and readiness	30	4	120	3	90	3	90	3	90
		2	Achievement possibility	20	4	80	3	60	4	80	4	80
		3	National and organisation's culture	15	3	45	0	0	1	15	1	15
		4	Commitment from top	20	4	80	5	100	4	80	5	100
		5	Infrastructure	15	3	45	4	60	3	45	3	45
Fashion	0.10	1	Follow best practices, competitors, books, journal	50	3	150	0	0	4	200	3	150
		2	Suggested by consultant, experts	0	2	0	0	0	2	0	4	0
		3	Follow trends	50	2	100	0	0	4	200	3	150
EVALUATION	Strategic fit score					365		330		350		415
	Pay-offs score					360		240		180		410
	Organisation fit score					370		310		310		330
	Fashion score					250		0		400		300
	Overall score					353		262		288		385
Rank					2		4		3		1	
Area weight	0-1.00			Total = 1.00								
Sub-criteria weight according to	0-100			Total = 100								
Rating Score	1-5			1 = Very low to 5 = Very high, See Proforma for rating								

**Result**

Figure 7.10: Selection matrix from the Essilor Philippines' plant



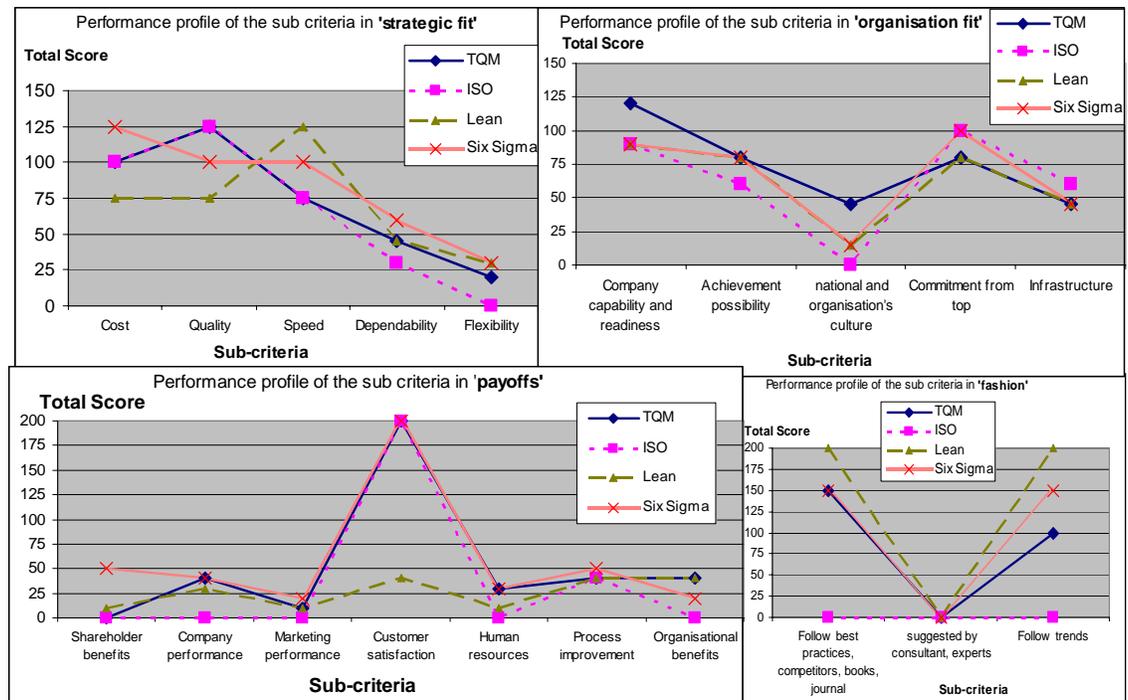


Figure 7.11: Performance profiles from the Essilor Philippines' plant

The result from Essilor’s Philippines plant showed that Six Sigma was the preferred methodology with the highest overall score (Figure 7.10). However, as can be seen in Figure 7.10, not all selection views support Six Sigma - it did not score highest on the criteria of ‘organisation fit’ and ‘fashion’. This is the situation where the graphical profiles and selection matrix help provide an understandable and transparent analysis. The profile of selection views in Figure 7.11 show the perceived weaknesses of the Six Sigma methodology – for example, the Six Sigma graph is below TQM in the ‘organisation fit,’ and scores lower than Lean in the ‘fashion’ category. The second-level performance profile showing the sub-criteria in selection view ‘organisation fit’ reveals that the ‘company’s capability and readiness’ and the ‘national and organisation’s culture’ are the factors which are perceived to be weaker for Six Sigma than TQM. This analysis suggests that if Six Sigma was adopted, the company should consider strengthening company capability and organisational culture to support the Six Sigma methodology. This example illustrates how performance profiles can explain the reasons to adopt improvement initiatives as well as point out weaknesses of the initiatives from the managers’ perspective.

**Reflections on the weighting and rating scores from the workshop with Essilor**

Three reflections from the workshop related to the weighting and rating score are:

1. *Pay-offs and strategic fit are major considerations followed by organisation fit and fashion respectively.* The relative weighted scores for the four selection views show the important factors for selecting improvement initiatives according to the perceptions of managers in Essilor. The ‘pay-offs’ category appears to be a major concern followed closely by the alignment to organisational direction - ‘strategic-fit’ - and medium consideration is given to organisation fit. The unavoidable influence from fashion accounts for ten percent in the selection of all plants. These weighting results align with the criteria identified from the case studies and interviews in Chapter Six, i.e. pay-offs and strategic fit are major concerns for managers, while organisation fit is more important for consultants and fashion appears to the decision-makers as a minor criterion for the selection.
2. *Perceptions on the degree of effectiveness and impact of the improvement initiatives vary between plants and hence are reflected in the choice made.* Perceptions of the consequences of each improvement initiative for each of the sub-criteria showed differently in these four plants, although they were provided with the same pieces of information. Only Six Sigma obtained the highest score on ‘strategic fit’ in all plants due to the fact that Six Sigma is now a company-wide implementation programme at Essilor. Managers from the India and Thailand plants believed in the effectiveness of TQM on pay-offs and ISO9001 on the organisation fit more than other initiatives whereas the Philippines plant valued Six Sigma more on strategic fit and pay-offs. The total scores indicate the managers’ perceptions that TQM is the most preferable initiative for the India plant, while ISO9001 received the highest score for the Thailand plant and Six Sigma was still the preferred programme for the Philippines and China plants. These inconsistencies in the choice made between the plants also reflect the resistance to Six Sigma, a company-wide deployment. Follow-up interviews with a MBB of the Asia-Pacific region revealed the resistance to the Six Sigma programme in India plant; he explained:

‘Without good change management, implementing Six Sigma is useless. For example, Thai people must be motivated by money; in our India plant it is even worse since more than 99 percent of the male employees are poor. Without monetary prizes, they would not do any Six Sigma project; hence at the India plant we offer a certified BB for \$1000, if someone implements one project he

receives another \$1000, and many other free gifts are distributed such as shirts and pen with the message 'Six Sigma Essilor' on them.

3. *Some similar patterns of the rating score can be identified* in the pay-offs and strategic fit i.e. the managers believe Six Sigma would contribute to cost improvement more than the others; TQM highly improves quality; Lean effectively improves speed; and ISO9001 would assist process improvement. These similar relative ratings reflect the common understanding of the benefits of these improvement programmes as suggested in the QM literature (Bendell 2005; Oakland 2005; Andersson *et al.* 2006).

The author also conducted further testing with smaller businesses, in order to investigate the wider applicability of the decision aid, refine the spreadsheets and develop a supporting workbook.

### **7.5.2 Workshop with Small and Medium size Enterprise (SMEs)**

This workshop was carried out with a group of 17 Thai business owners in small and medium size enterprises (SMEs). Most of the participants were in their middle age or older. They were experienced and successful entrepreneurs: most of the businesses have been operating for more than 10 years. Some companies had already been certified with ISO9001, while many of them were deciding whether or not to apply for the certification. TQM and ISO9001 were currently their interests. Hence, the workshop was conducted by the author, assisted by an expert facilitator, to guide their selection decision. Since all 17 participants come from different business types, the facilitators divided them into two groups: manufacturing and service. Each participant chose to join a group whose members owned similar types of business. Then each group nominated one type of business as a case example. The first group formed company X which was designated as an umbrella manufacturing company. The second group formed company A which assigned to be an umbrella selling company. Figure 7.12 illustrates the initial briefing and the two groups of decision-makers.

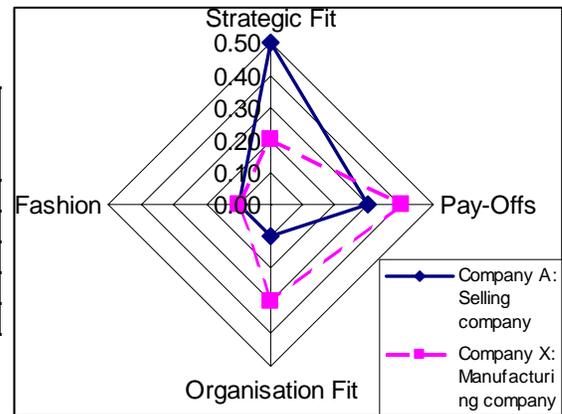


Figure 7.12: Two groups of decision-makers from SMEs

### **Results and analysis**

During the initial briefing, the facilitators explained and translated the selection framework and the decision aid into the Thai language. The decision-makers from both teams agreed to use all four selection views and their sub-criteria. Many participants expressed the opinions that that all the criteria provided were clear, comprehensive, and compact. The participants from both teams actively discussed and provided their opinions of the relative weights for each criteria and sub-criteria until the group consensus was reached. This step took longer than the workshop with Essilor, as all the criteria, which are in English, needed to be translated and clarified into easy Thai language. The weighted criteria from both teams were similar: pay-offs appeal to them as highly important. The selling company A perceived the strategic-fit as the most significant factor followed closely by pay-offs. Minor consideration was organisation fit and fashion. On the contrary, the manufacturing company X valued pay-offs as the most important criteria followed closely by organisation fit, and strategic fit, while fashion received a small weight. Figure 7.13 shows the relative importance of each of the four selection views.

Selection's views	Company A: Selling company	Company X: Manufacturing company
Strategic Fit	0.50	0.20
Pay-Offs	0.30	0.40
Organisation Fit	0.10	0.30
Fashion	0.10	0.10
Total	1.00	1.00



**Figure 7.13: The relative importance of the four selection views in SMEs workshop**

The weighted criteria and sub-criteria varied between the two teams; although some similar priorities could be observed. For the manufacturing company X, cost and quality were their prime focus; while in the selling company A, speed and cost were important. The expected benefit of improving marketing performance was significant to the selling company A; while increasing operating performance was important to the manufacturing company X. The results show that both teams perceived successful implementation, the adoption of best practice, and suggestions from experts as a strong influence on the decision.

Once all weights were allocated, the participants then rated TQM and ISO9001 against 20 sub-criteria based on their on-hand information and their perceptions. In this step, the entrepreneurs who had experienced and were familiar with ISO9001 and TQM shared their understanding and the team discussed, assessed, and agreed upon the rating scores. The overall results and performance profiles from the umbrella manufacturing company X are illustrated as an example in Figure 7.14 and Figure 7.15. The results and analysis from the selling company A are illustrated in Appendix 35.

**Selection matrix of management tools**

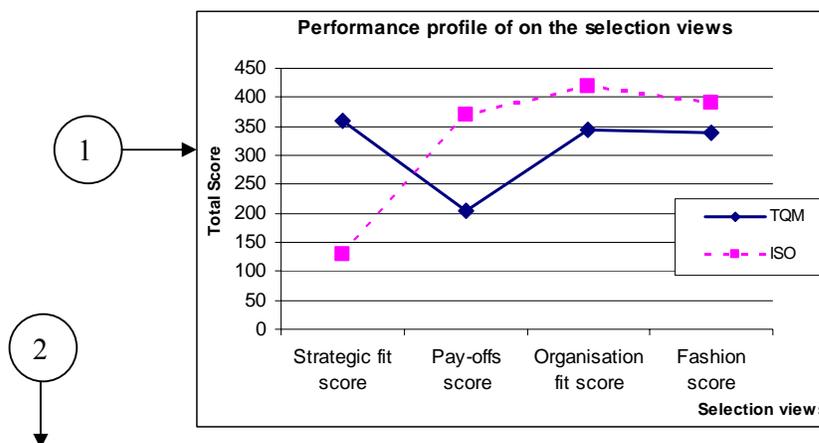
Company's name: .....Umbrella manufacturer X

Date:....26 March 2006

Type of industry: Manufacturing or Service, Type of product/ service:...Umbrella.....

Selection's views	Area Weight	No.	Sub-Criteria	Company's Importance	Rate Initiatives			
					TQM		ISO	
					Score	Weighted Score	Score	Weighted Score
<b>Strategic Fit</b> (Direction/ vision, KPI, OW/OQ)	0.20	1	Cost	30	4	120	1	30
		2	Quality	30	3	90	2	60
		3	Speed	20	4	80	1	20
		4	Dependability	10	3	30	1	10
		5	Flexibility	10	4	40	1	10
<b>Pay-Offs</b>	0.40	1	Shareholder benefits	15	1	15	3	45
		2	Company performance	25	2	50	3	75
		3	Marketing performance	10	2	20	4	40
		4	Customer satisfaction	10	1	10	5	50
		5	Human resources	10	2	20	4	40
		6	Process improvement	15	2	30	4	60
		7	Organisational benefits	15	4	60	4	60
<b>Organisation Fit</b>	0.30	1	Company capability and readiness	0	4	0	4	0
		2	Achievement possibility	40	4	160	4	160
		3	National and organisational culture	35	3	105	4	140
		4	Commitment from top	20	3	60	5	100
		5	Infrastructure	5	4	20	4	20
<b>Fashion</b>	0.10	1	Follow best practices, competitors, books, journal	50	3	150	4	200
		2	Suggested by consultants, experts	40	4	160	4	160
		3	Follow fashions	10	3	30	3	30
<b>EVALUATION</b>	Strategic fit score				360		130	
	Pay-offs score				205		370	
	Organisation fit score				345		420	
	Fashion score				340		390	
	Overall score				292		339	
	Rank				2		1	

Figure 7.14: Selection matrix from the umbrella manufacturing company X (SMEs)



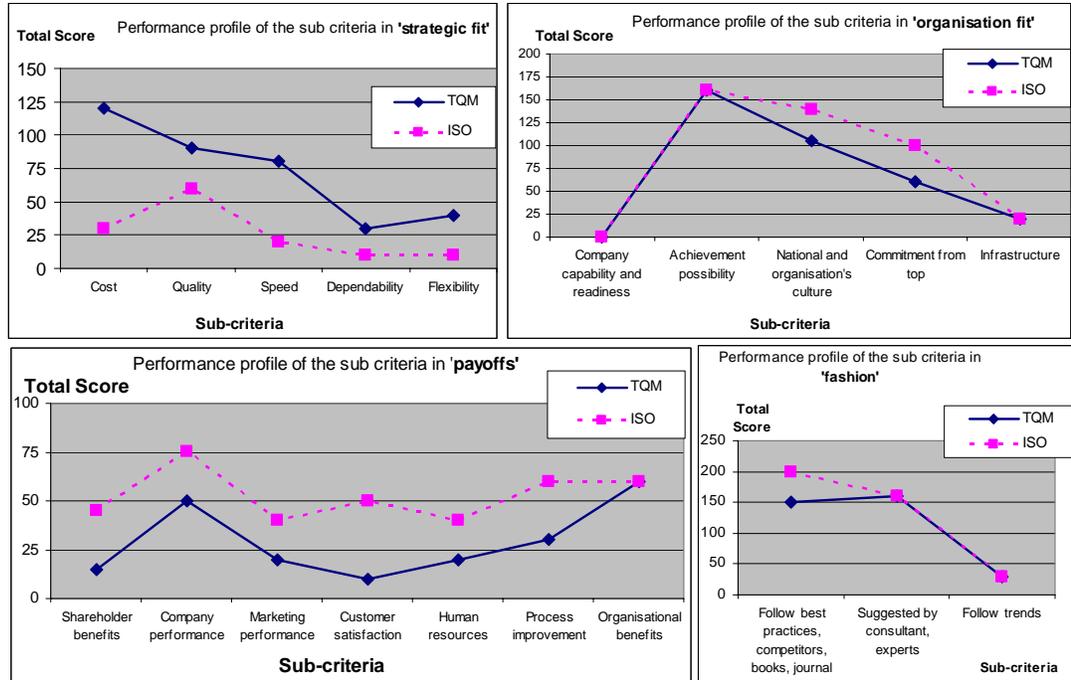


Figure 7.15: Performance profiles from the umbrella manufacturing company (SMEs)

The results from manufacturing company X showed that ISO9001 was the preferred initiative with the highest overall scores (Figure 7.14). However, ISO9001 did not score highest on the criteria of ‘strategic fit’ as shown in Figure 7.14. The performance profile in Figure 7.15 clearly indicated this weakness of ISO9001 from the perception of the SME entrepreneurs in the manufacturing team; while the ISO9001 dominated TQM in the other three selection views. The analysis suggests that adopting ISO9001 would have a lower alignment to the company’s objectives, while satisfying the expected benefits gain, fitness to organisation, and following the fashion in SMEs context.

**Reflections on the weighting and rating scores from the workshop with SMEs**

The weighting and rating scores from the SMEs workshop suggested that:

1. *Pay-off is a major consideration.* As with the workshop with Essilor, pay-off held great significance according to managers’ perceptions. However, in the SME manufacturing team, organisation fit appeared more important than strategic fit and both teams considered fashion as a minor influential factor. The difference in the weight score reflects the different competitive environments between the service and the manufacturing teams; while the similar high significance of pay-off always remains as a critical criterion for the selection.

2. *The Pattern of the rating scores is similar.* Both SMEs teams clearly rated ISO9001 better than TQM in the two categories of pay-offs and fashion and TQM is better in the strategic fit category. Only the organisation fit category is different, as the service team perceive TQM as a better fit and the manufacturing team believe ISO9001 would suit them more. Results from the rating scores similarly reflect the managers' belief that adopting ISO9001 would result in higher pay-offs and follow the fashion but it is a less well suited to the company's direction in the context of SME business.

These workshops tested both the selection framework and the decision aid. The results and analysis of the weighting and rating scores from the workshops provided an understanding of the managers' perceptions regarding the levels of importance of each criterion and sub-criterion. The following section describes the feedback and suggestions for improvements.

### ***7.5.3 Feedback and suggestions for improvement***

Feedback on the application of the selection process and decision aid was obtained through the assessment questionnaire, discussions with the participants and reflections from observation in the workshop. The results from assessment questionnaires indicate the participants' view of the overall selection process and the decision aid in terms of feasibility, usability, and utility. The sub-criteria and questions used to assess them are shown in Appendix 12. Moreover, the discussions with participants and the facilitators' reflection from observation enriched the feedback and captured additional areas for improvements. 13 questionnaires from the Essilor Company and 17 questionnaires from the SMEs groups were collected and analysed after the workshops. The result of evaluation of the workshop with Essilor is presented in Figure 7.16. The average evaluation scores from the workshop with Essilor compared with the SMEs group are illustrated in Figure 7.17. The evaluation score range is 1 to 5 (1 = strongly agree; 2 = agree; 3 = neutral; 4 = disagree; 5 = strongly disagree).

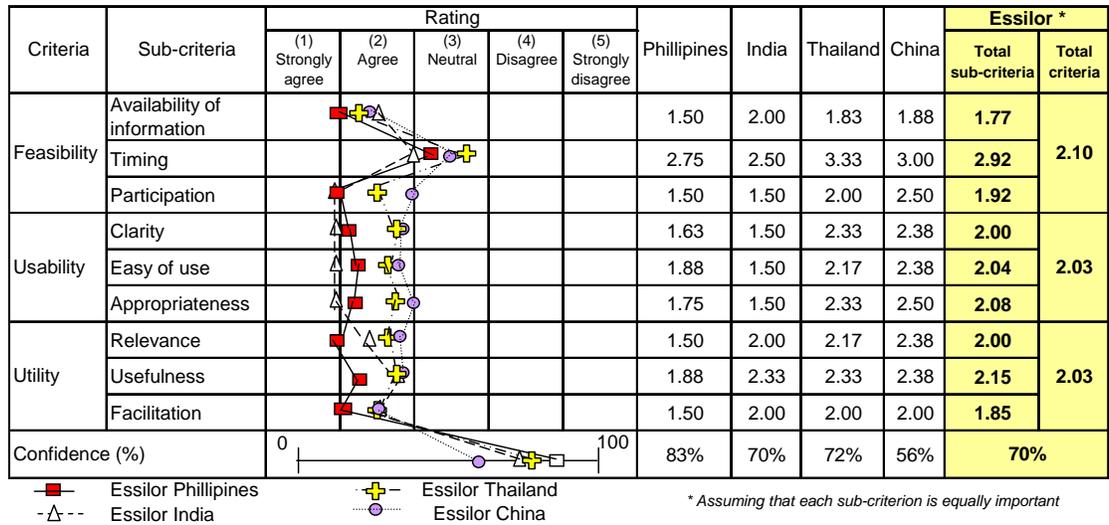


Figure 7.16: Summary of the assessment questionnaires from the Essilor workshop

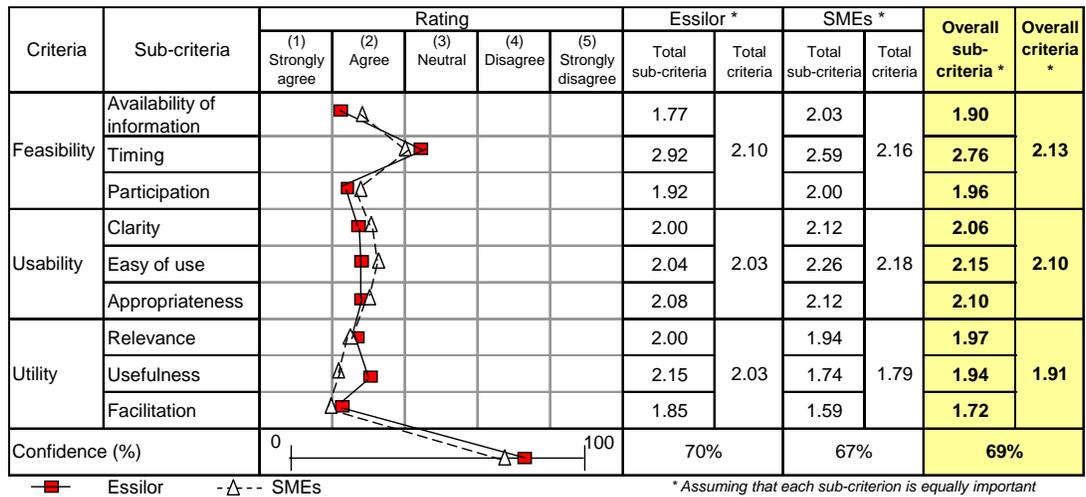


Figure 7.17: Summary of the assessment questionnaires from Essilor and SMEs workshops

Overall, the evaluation process was highly rated against the three main criteria of feasibility, usability and utility. The participants had a relatively high level of confidence in the recommended results from the decision aid with an average of 70 percent confidence for the Essilor workshop and 67 percent for the SME one. The overall impression gained from the participants was that the selection framework was very useful in providing a structured and holistic view of selection issues and the evaluation process. Participants agreed that the decision aid provided a comprehensive selection process which covered all of their criteria for the selection, and encouraged participation. They also considered that the selection process was logical, clear, well

structured and could be easily followed. An SME participant admired the fact that ‘the evaluation and the suggested results are measurable’. Moreover, the participants appreciated the fact that the important pieces of information obtained from the initial briefing were concise and clear. The information/ knowledge required to undertake the workshop was ‘quite available’ and the knowledge and experiences of the participants can be used as a source of information. Additionally, the participants strongly agreed that the facilitators provided useful guidance throughout the evaluating and selecting process.

The only sub-criterion for which some reservations were apparent was timing, where some participants felt they needed additional time to acquire more information, in order to rate methodologies accurately. Many participants agreed that the rating process is the most difficult step, as more time and more information were needed to evaluate the impact of initiatives, and to gain consensus agreement in the team. Some participants from the SMEs group commented on the difficulty of using the model, due to the problem of translation from English to Thai. A number of suggestions for improvements included: to increase the time for rating, clarify the definition of criteria, and acquire more information about all the initiatives to enhance confidence in the selection. A minor suggestion, recommended by a quality senior engineer from the Essilor Thailand plant, is the improvement of the graphical displays which need to be re-adjusted into a compact format i.e. all output on one page. At the workshop, the graphical outputs were not on the same page. Hence, the facilitator needed to be in front of the computer screen and switch between the selection view graph and the other four sub-criteria graphs while providing the explanation of the results.

In addition to the participants’ views summarised from the questionnaires, the facilitators held discussions with the participants and observed the workshop; this enriched the feedback and identified further areas for improvements. The participants highlighted the fact that the selection framework provides a holistic view and relevant criteria for selecting the initiatives. Managers from the Philippines, Thailand and China plants agreed that the framework provides a good quick overview and has covered all important criteria; although there is a wide range of sub-criteria which take time to evaluate. The process for evaluating and selecting is structured, and easy to follow, and

many participants agreed that this is a key strength. They found that this structured and easy-to-follow process would ease and shorten their decision-making process. Additionally, the participants expressed that the WSM method is logical and the process of weighting and rating guided them in the direction of deeper thinking about the advantages and disadvantages of each initiative. They believe that the WSM method would yield a more accurate choice than the method they would have used previously.

Nevertheless, the facilitators found that language barriers may cause difficulty to non-English-speaking people and hence skilful facilitators are important to the success in explaining the framework and conducting the decision-aid. In the workshop with Essilor, all instructions were given in English during the initial briefing. As English is not a mother language for Chinese and Thai employees, the more explanations and clarification were needed for these two teams. For the SMEs case, the English language of the decision aid model and its process had to be translated into simple Thai words. Formal Thai language is not enough; the facilitators needed to change those formal Thai words into simple and local language to provide in-depth and understandable explanations to the SMEs owners. For example, the word fashion is officially translated in Thai as ‘Tarm Ni Yom.’ But to enhance its explanation to SMEs owners we used the more colloquial words ‘Tarm Hae’ or ‘Tarm Kra Sae’. This is due to the fact that many SME owners, especially the older generation, are not well-educated, and are more familiar with colloquial words than with technical words. Hence, the skilful facilitator was vital to success in implementing the decision-aid for the SMEs group.

## **7.6 THE REFINED FRAMEWORK AND PROCESS**

The findings from the testing with a multi-national company and an SME group revealed that the proposed selection framework and its criteria are relevant and comprehensive, as all selection views were used and no additional factors were needed in the decision to select improvement initiatives. The decision aid could help in making accurate decisions in a relatively short time. The participants appreciated the guidance provided by the decision aid, which they believed helped them both to develop a clear vision of their current position, and position important information (such as the advantages and disadvantages of each methodology) to support the evaluation. The initially proposed four process steps for evaluation are appropriate; however, there were

some suggestions for refinements. These improvements relate to the timing of the workshop, detailed definitions of the criteria, and the graphical display of the outputs. The two case studies highlight the fact that additional time is needed to acquire more information during the rating process. Moreover, it was suggested that the detailed definitions of the sub-criteria should be clarified in the form of a workbook or manual which will make the process and framework easier to use. Lastly, performance profiles in the analysis step should be re-arranged and presented in a one-page format which enhances the user-friendliness of the presentation of information. These refinements of the selection process will facilitate further testing and perhaps enhance the feasibility and usability of the decision aid.

## **7.7 CONCLUSIONS**

Managers face complex and multi-faceted decisions when selecting improvement methodologies, which could have major implications for the success of their business operations over many years. In this situation there is a need for strategic, holistic decision-support mechanism, able to take account of all major factors which will affect the choice and its outcomes for the business. To be effective, such mechanisms must be grounded in strategic operational considerations and utilise appropriate, yet transparent and easily understood evaluation mechanisms to encourage rational decision-making. The multi criteria decision aid described in this chapter encourages managers to step back and consider all the key factors before selecting any improvement programme. It provides managers with comprehensive selection criteria within a structured and formalised evaluation process. The decision aid is underpinned by a selection framework based on strategic operational considerations, and employs well known and widely accepted evaluation methods. This decision support process aims to promote rational decision-making and assists decision-makers to structure their evaluation process, compile useful information, and reach a consensus decision with confidence. Practical testing of the decision aid with a multi-national company and an SME group has provided evidence of its feasibility, usability, and utility.

## **CHAPTER 8. DISCUSSION AND CONCLUSION**

This research examines how a manager should select and adopt improvement initiatives in today's competitive environment and with a confusingly large number of improvement programmes to choose from. Currently, selection decisions are rarely structured, and the selection criteria are inconsistent and may vary between managers; hence, the adoption of improvement initiatives is based on ambiguous judgements and is prone to follow fashion. Research has had little to offer the manager in this regard. This research aimed to fill this gap by exploring QM and CI practices and their selection criteria, and developing and testing a decision aid to assist managers undertaking selection decisions. This chapter summarises and discusses the knowledge gained from this research and identifies areas for further research. Section 8.1 presents a summary of key evidence and research findings answering the research objectives. Section 8.2 concludes the contribution to knowledge in the areas of QM and adoption of initiatives. Section 8.3 indicates the limitations of this research, and finally section 8.4 suggests areas of future research.

### **8.1 SUMMARY OF THE RESEARCH FINDINGS**

The main outcome of this research has been the development and testing of a selection framework and a decision aid for selecting improvement initiatives. This framework can assist managers to systematically choose suitable improvement programmes for their company. The conceptual background underpinning the selection framework was grounded in the quality management, organisational behaviour, strategic decision-making, and operations strategy literature, which provide a comprehensive set of selection views.

The selection framework was developed in three phases: establishing a conceptual background, developing a framework, and testing the decision aid. Firstly, detailed literature studies explored the influential factors of fashion setting and pay-off, and established the initial conceptual background. Secondly, three in-depth case studies plus two additional cases, and fourteen interviews with experts all provided in-depth knowledge of QM and CI practices in the companies concerned, and a comprehensive selection framework was constructed, which was theoretically and empirically

grounded. The framework indicated four selection criteria: fashion setting, pay-off, strategic fit, and organisation fit. It was then incorporated with a MCDA method, which provided a structured process and a logical evaluation method for the selection. Results from the tested case studies demonstrated high feasibility, usability, and utility of the decision aid and the selection framework.

Table 8.1 below is organised by research objectives, as listed in Chapter One, and is provided to indicate the way in which these objectives have been achieved. In addition to achieving these original research objectives, this research also led to a number of more detailed findings which are summarised in the table. The chapter(s) in which findings are presented has been indicated in each case.

**Table 8.1: A summary of research objectives and key findings**

Research objectives	Chapter	Key evidence and findings
<b>1) To investigate the approaches, activities, and trends towards continuous improvement.</b>	4	<b>Fashion phenomenon in QM and CI</b>
1.1 What are the trends in academic and business publications related to the various QM and CI approaches?	4	<ul style="list-style-type: none"> <li>▪ The two main fashions as regards QM and CI during 1990-2004 were TQM and BPR, peaking in 1993 and 1995 respectively. They showed a classic ‘bell-shaped curve’ with sharp rise and fall in citation hits.</li> <li>▪ The number of publications indicates a shift in academic and business interest from TQM, BPR, and ISO9001 towards Knowledge Management, Six Sigma, Lean and Balanced Scorecard.</li> </ul>
1.2 How do patterns in company usage of these approaches compare with publication trends?	4	<p>A quantitative comparison of publication trends with company usage data shows that publication and usage trends appear to resemble each other.</p> <ul style="list-style-type: none"> <li>▪ Trends in publication and company adoption for TQM, BPR, BSC, and KM had strong relationships (correlation values &gt; 0.7).</li> <li>▪ However, industrial usage tends to lag behind academic discussion and may endure after the latter declines.</li> </ul>
1.3 What adoption patterns are seen across the globe and how do these vary for different fashions?	4	<p>Life cycles of fashions on the consumer side may be different from the fashion setter side. A ‘bell-shaped curve’ was not indicated from the company usage data.</p> <ul style="list-style-type: none"> <li>▪ Time delay effects in global dissemination, cultural compatibility, and changing degree of readiness may result in a comeback usage and interest of an older approach (without a higher level of publications).</li> <li>▪ Adapting the previous fashion or blending with new ideas could sustain interest in older ideas.</li> <li>▪ Countries in Asia and the newly-industrialised countries show high interest in QM and CI initiatives.</li> </ul>



Research objectives	Chapter	Key evidence and findings
<b>3) To provide an empirical study of QM and CI activities and their effects in organisations</b>	5, 6	<b>QM and CI activities in Thai companies</b>
3.1 What is the development of QM and CI and the most widely adopted initiative in Thai companies?	5, 6	<ul style="list-style-type: none"> <li>▪ The scope of QM and CI in Thai companies has been enlarged from quality and productivity improvement to organisational development.</li> <li>▪ TQM, ISO9001, and Thailand Quality Award are still widely adopted in Thai companies; whereas Six Sigma and Lean have been newly introduced in Thailand by a multi-national company.</li> <li>▪ Adopting too many initiatives without a management framework and clear communication brings in the problem of ‘initiative fatigue.’</li> </ul>
3.2 Why and what triggered companies to adopt improvement initiatives?	5, 6	Triggers for the adoption are the internal factors (need to survive, sustain competitiveness, and increase operational effectiveness) and external factors (institutional push, trade barrier, and company image).
3.3 How do companies adopt improvement initiatives?	5, 6	Top management team are the decision-makers for all adoptions, but sometimes consultants influence the choice made. There is no evidence of a structured selection process and evaluation for these CI initiatives, although experts use two approaches: rule of thumb and gap analysis.
3.4 How does the adopted initiative affect the company in terms of cost and time investment?	5	<p>The adoption of these programmes consumes a large amount of time and resources:</p> <ul style="list-style-type: none"> <li>▪ TQM costs around 7 million baht per year, quality awards cost between 3-7 million baht per application, and ISO9001 certification costs between 0.4-1 million baht per year. Six Sigma training costs at least 1 million baht per year.</li> <li>▪ Time to fully run the programme ranges between 1 and 10 years.</li> <li>▪ QM and CI activities are conducted during regular working hours, during which employees spend between 20-80 percent of their time on the activities.</li> </ul>
3.5 What are the critical success factors and motivations for QM and CI activities?	5	<ul style="list-style-type: none"> <li>▪ Major critical success factors are: top management commitment, positive employee attitude, clear communication, rewards and recognition.</li> <li>▪ The main motivations for CI activities are: benefits to employees and company</li> </ul>

Research objectives	Chapter	Key evidence and findings
<b>4) To identify major criteria to be considered in selecting improvement initiatives and develop a framework for selection.</b>	6	<b>The main elements of the selection framework are triggers for CI, selection criteria, and the critical success factors.</b>
4.1 What are the major selection criteria?	5, 6	Influential criteria for the selection are fashion setting, pay-off, strategic fit, and organisation fit. However, organisation fit and strategic fit were the most frequently suggested criteria.
4.2 What are other implications of the selection process?	6	<ol style="list-style-type: none"> <li>1) Integration of all the adopted initiatives and placing them in a management framework are suggested as an effective way to manage all CI activities.</li> <li>2) The two sustainability factors for the adopted initiatives are: internal motivations, as a short-term factor, and the integration with an organisational culture, as a long-term one.</li> <li>3) A series of emerging initiatives and their adoption by several companies create a management fashion supply chain in which the processes are determined by fashion setters and users.</li> </ol>
<b>5) To develop, refine, and test a strategic decision-aid model for selecting an improvement initiative.</b>	7	<b>The decision aid for selecting an improvement initiative is composed of a process and spreadsheets for data input and analysis.</b>
5.1 What kind of evaluation method can be used to provide a directive process and consider multiple criteria and managers' preferences for the selection decision?	2, 7	<p>The MCDA principle is the most appropriate group decision-making method for selecting improvement initiatives which assist managers to translate their judgements into quantified preference choices.</p> <ul style="list-style-type: none"> <li>▪ The WSM method was chosen as it is easy to follow, widely used by practitioners, and produces reliable results.</li> <li>▪ The four selection steps are: brainstorming and agreeing upon the criteria, weighting, rating and ranking, and finally the result and analysis.</li> </ul>
5.2 How feasible, usable, and useful are the decision aid and selection framework?	7	The decision aid and the selection framework are demonstrated to be feasible, usable and useful during their application in a multi-national company of four plants in Asia Pacific and two groups of SMEs. The managers confirmed its usefulness in providing a structured process and a holistic view of the selection decision.

## 8.2 CONTRIBUTIONS TO KNOWLEDGE

This research provides significant contributions to quality management knowledge in five areas: the management fashion phenomenon, a comprehensive literature review assessing the pay-off evidence, the development of QM and CI, the theory of adoption of QM and CI initiatives, and the application of MCDA in the QM context.

- **The management fashion phenomenon: the case of QM and CI initiatives**

Much literature discusses management ideas as fads or fashions. Previous research on management fashion focused on fashion creation and diffusion by fashion setters. This research provides a better understanding of the management fashion phenomenon (in terms of linkage between supply and demand) using the case of QM and CI initiatives. The results confirm the existence of the management fashion phenomenon, the dissemination of initiatives across the globe and how they have been adopted by business worldwide. Thus, fashion setting is one of the undeniable criteria for selection.

- **A comprehensive quantitative literature review assessing the pay-off evidence**

Many claims for the effectiveness of particular programmes have been made; however, their various pay-off claims have not been studied in a rigorous manner. Thus, the research contribution of the extensive quantitative literature review in Chapter Four is to assess amount and credibility of the pay-off evidence, and compare QM and CI initiatives through this lens. The pay-off matrix has been proposed to provide decision-support information.

- **The theory of adoption of QM and CI initiatives**

The advancement in the theory of the adoption of improvement initiatives is the main contribution of this research. It has provided and synthesis between QM, operations strategy and organisational behaviour literature, regarding the selection decision. Some authors believe that the adoption of management fashion is complex and strongly influenced by the power of fashion setters; while other literature has emphasised critical questioning and rational justifications for the adoption. The selection framework has attempted to surface the irrational influences on the adoption to provide a more rational and less ambiguous justification. This research introduces four main criteria for selecting improvement initiatives and provides a selection framework incorporating comprehensive criteria and a holistic model.

- **The application of MCDA in the QM context**

A number of recent articles have pointed out the importance of research in managing business ideas and have recommended careful consideration of the criteria for adoption of programmes. A plethora of QM and CI initiatives have emerged over the past 50 years, which makes it particularly difficult for managers to choose. Previously, there was no research on developing a decision-aid and applying a MCDA method to selecting QM and CI approaches. This research has developed and tested such a decision-aid, and found it had high usability, enabling the selection process to be more structured and formalised. The logic of MCDA is appropriate for the selection of QM approaches, because it allows managers to consider a company's context and enhances rational evaluation.

### **8.3 LIMITATIONS**

The fact that no modifications to the selection framework were required after testing indicates that a good level of usability has been reached. Though the decision aid and the selection framework have been tested and shown to be useful to assist managers in the selection decision, there were some limitations due to the time constraints of this research. Firstly, the selection framework and the decision aid which were developed and tested were primarily based on companies and experts in Thailand. Although the decision aid has been tested with a multi-national company, there might be other conditional factors and variation in the selection sub-criteria in other countries and industrial contexts. Secondly, due to the time constraints of this research, only three in-depth case studies and fourteen interviews with experts have been conducted for theory building, and two case studies for theory testing. The comprehensiveness and robustness of the decision aid might be improved if more test cases were applied. Thirdly, the decision aid model is based on several assumptions. The approach assumed that managers' preferences can be quantified and the rational manager makes choices that maximise their utility function. The main criteria are established and weighted mathematically, thus reducing the subjectivity in the decision. However, the result and analysis represent the managers' perceptions and judgements, based on the information available. Hence, gathering greater and more reliable information would increase the credibility of the choices made.

## 8.4 AREAS FOR FUTURE RESEARCH

The limitations outlined above suggested the following areas for further work.

- **Investigate the application of the decision aid with other types of organisation and different geographical regions.** The results of this research mainly focused on manufacturing and service companies in Thailand. However, the dissemination and the adoption of quality and improvement initiatives have also spread and occurred in the other types of organisation such as local government authorities, education, and health care organisations. For example, according to a survey of UK local government associations (1999), 97 percent of all authorities in the UK are involved in quality initiatives and different local authorities employed different techniques. The context of these organisations may be different from the business-oriented one; hence, further research is required to study and test this decision aid in different types of organisation and regions in order to generalise the framework, and to identify the wider applicability of the decision aid in broader industrial contexts and different regions.

- **Investigate the application of the decision aid with an independent test case.** Further research could be carried out to test the application of the decision aid without the facilitation of the researcher. This could help identify the wider applicability of the decision aid in a broader industrial context.

- **Gathering more empirical evidence of the effectiveness of initiatives.** The rating results compared to the claimed pay-offs from the literature study in Chapter Four reveal that both benefits in the area of customer satisfaction and company performance have already been published with high credibility. However, the area of process improvements which was perceived as significant in the opinions of managers and experts still needs further research and more empirical evidence to support the selection decision. Other suggested benefits (for instance shareholder benefits and marketing performance) are not highly motivating factors for the adoption of these QM and CI programmes. Hence, the author suggests that future research should focus on developing improvement programmes which could enhance the three main areas of customer satisfaction, company performance, and process management. Moreover, both existing and new initiatives need more empirical research into their effectiveness and impact on organisations, particularly in the process improvement area, in which credibility from publications is needed to support the decisions

about adoption. The author believes that further research is needed to provide more empirical evidence about the effectiveness of improvement methodologies and to enhance confidence in the selection of improvement approaches, using decision aids such as the one described here.

- **Develop a workbook.** As suggested in both case studies, a workbook or computer-based aid should be developed to give guidelines on the selection process and a detailed definition of the criteria; this is likely to make the process more 'usable'. It could also be used to facilitate further testing and refinement of both the selection framework and the decision aid in a broader industrial context.

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## APPENDICES:

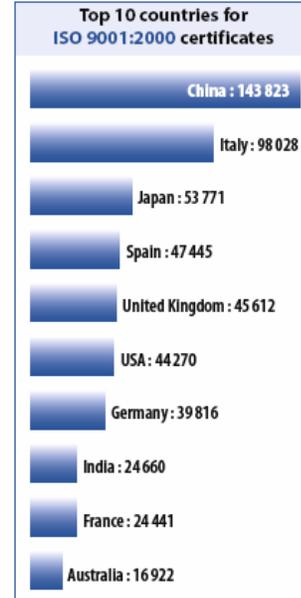
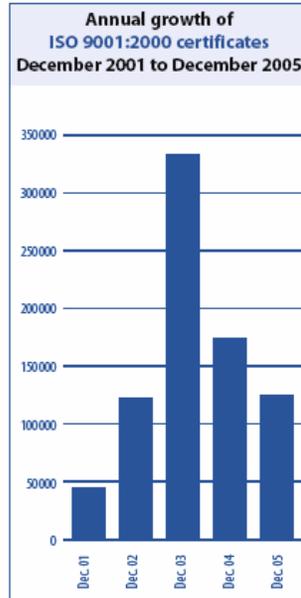
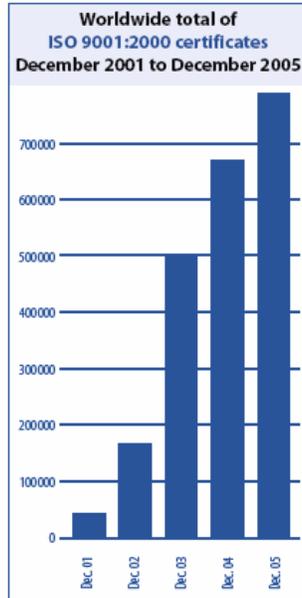
### Appendix 1: Theoretical Gap in QM and CI literatures

Key mentioned elements	Direct Improvement				Indirect Improvement				External Assessment Benchmarking
	Incremental improvements		Dramatic Improvements		Internal Assessment		Self-assessment		
	TQM	ISO9001 (ISO9001:2000)	Lean production	Six Sigma	BPR	Balanced Scorecard	Self-assessment by MBNQA	Self-assessment by EFQM	
<b>Principles</b>	Bergman & Klefsjö (1994), Dahlgaard (2001), Flood (1993), Kano (2004), Kaye & Dyason (1995), Dale et al. (2001), Rommel et al. (2002), Joyce (1994), Imai (1986; 1997), Machu (1998), Asaka & Ozeki (1990), Fukuda (1989), Mizuno (1988)	DTI (2004c), Conti (2004), Bridget (2000), ISO (2004)	Feld (2001), Womack & Jones (2003), Dahlgaard (2001), Devane (2004)	Pande et al. (2000), Adams et al. (2003), Bhoite (2002;2003), Breyfogle et al. (2001), Devane (2004), Gupta (2004), Joseph & William (2004), Smith & Blakeslee (2002), Hammer (2001;2002)	Hammer & Champy (1990), Davenport & Short (1990), Madu (1998), Hammer (2001), DTI (2004b)	Kaplan & Norton (2001)	Hurton (2000), Byrne & Norris (2003), Hodgetts (1993)	Dale et al. (2000), Conti et al. (2003), Sun et al. (2004)	DTI
<b>Methodology/ Roadmap</b>	Conti (2002), Joyce (1994), Imai (1986; 1997), Machu (1998)		Feld (2001)						Joyce (1995)
<b>Tools</b>	Asaka & Ozeki (1990), Fukuda (1989), Mizuno (1988)								
<b>Strengths/ Weaknesses</b>	Hendricks & Singhal (1997), Sun et al. (2004), Easton & Jarrell (1999)	Ussahawanitchakit & Tansuhaj (2003), Douglas (2003), Sun et al. (2004), Zuckerman (2000)	Oliver (2002), Zayko et al. (2003)	Goh et al. (2003), Hammer (2002)	Maclea & MacIntosh (1997), Boje et al. (1997)			Sun et al. (2004)	
<b>Critical Success Factors</b>	Dayton (2003), Black & Porter (1996), McAdam & Henderson (2004)			Antony & Bamelas (2002)	Davenport (1993)				
<b>Criteria and procedure for selection</b>				<b>Gap</b>					

## Appendix 2: Worldwide numbers of ISO9000 certificates (based on ISO survey 2005)

### ISO 9001:2000 principal results

World results	Dec. 2001	Dec. 2002	Dec. 2003	Dec. 2004	Dec. 2005
World total	44 388	167 124	497 919	660 132	776 608
World growth		122 736	330 795	162 213	116 476
Number of countries/ economies	97	133	149	154	161



**Appendix 3: Comparisons in core elements of Incremental Improvement (TQM, ISO9001, Lean Production)**

Elements	Direct Improvement		
	Incremental improvements		
	TQM	ISO9001	Lean
<b>Philosophy</b>	Management philosophy to increase customer satisfaction through continuous improvements by incorporating everyone in the organisation	Standard for International Quality Management System	Manufacturing philosophy continual pursuit of excellence which propel a path to world class manufacturer
<b>Aims</b>	To increase customer satisfaction by solving and improving product quality, maximise efficiency and performance of the organisation to achieve long-term business success	To ensure that the products/services conform to customer needs/expectations and objectives of the organisation To direct and control an organisation in order to continuously improve the effectiveness and efficiency of its performance	To reach a manufacturing perfection by eliminating wastes, increasing speed, and throughput and improving workflow
<b>Principles</b>	1.Focus on customers 2.Base decisions on facts 3.Focus on processes 4.Improve continuously 5.Involve everyone in the systems <i>(Bergman &amp; Klefsjö 1994)</i>	1.Focus on customers 2.Demonstrate leadership from top management 3.Involve all people in the organisation 4.Facilitate Process management through documentation and compliance 5.Thoroughly understand system approach 6.Improve continuously 7.Base decision on facts 8.Mutually beneficial supplier relationships <i>(DTI 2004c)</i>	Five primary elements of lean manufacturing: 1.Manufacturing flow 2.Process Control 3.Logistics 4.Oranisation (people development, training) 5.Metrics (transparent performance measure) <i>(Feld 2001, pp.4-5)</i>
<b>Methodology / Roadmap</b>	Team-based problem-solving techniques (Quality Control Circle) Deming cycle: PDCA/ PDSA (Plan, Do, Study, Act) and each step will answer the five Ws and an H (Who, What, Why, Where, When, and How)	To build a QMS must concern: 1.Design and build (the structure of QMS, goals and strategies linking to stakeholders' need) 2.Deployment and implementation (Clarify core processes and sub-processes) 3.Control (audit, review and assessment) 4.Measurement (determine process effectiveness and efficiency) 5.Review and communication to all employees 6.Improvement	Each element focuses on a particular area of focus and compartmentalizes the activities using project based approach
<b>Tools</b>	SPC, 7 QC tools, 7 Management tools, pareto analysis, process mapping, benchmarking, GEMBA, PFMEA, and any other quality tools	A QMS conceptual model of the ISO9001 standard composes of Management responsibility, Resource management, Product realisation, Measurement analysis and improvement	Process Mapping/ Value-stream mapping (identify VA and non VA) SMED, 5S, Standardised work, Balanced workflow, JIT, Pull systems (Kanbans), Inventory reduction, TPM etc.
<b>Participants</b>	Everybody in the organisation	Everybody in the quality system	Team based , multi-skilled workforce

Elements	Direct Improvement		
	Incremental improvements		
	TQM	ISO9001 (ISO9001:2000)	Lean production
<b>Strengths</b>	<p>1.TQM includes systems, methods and tools</p> <p>2.Effective TQM implementation affects the long-term operating performance such as higher profitability, enhance customer satisfaction, operational efficiency, and employee motivation</p> <p>3.TQM has been developed and improved since 1980 and it becomes an organisation's culture</p> <p>4.Low investments</p>	<p>1.Strengthen the control phase and create process stability through documentation and regular assessment</p> <p>2.Motivate management responsibility</p> <p>3.Improve process ownership, responsibility and accountability</p> <p>4.Develop and certify a quality assurance system</p> <p>5.Ensure customer confidence and enhance international recognition (for export) assisting marketing effectiveness through quality differentiation (<i>Ussahawanitchakit &amp; Tansuhaj 2003</i>)</p>	<p>1.Provide extension to the problem solving tool box</p> <p>2.Get quick results</p> <p>3.Do not require involvements from the whole organisation</p> <p>4.Create agility and efficiency organisation</p>
<b>Weaknesses</b>	<p>1.Lack of integration quality activity with bottom-line consideration (Quality oriented)</p> <p>2.Vagueness TQM concepts and unclearly define tools&amp;methods to be used (what, when and where)</p> <p>3.Not focus on leadership</p> <p>4.Unclear goal</p> <p>5.Lack of structured training program</p> <p>6.No breakthrough innovations since TQM base on improving on the existing processes/products</p>	<p>1.Savings are difficult to quantify</p> <p>2.Excessive documentation</p> <p>3.Not change the way of doing business</p> <p>4.Implementation results show no significant difference in financial performance</p> <p>5.Not focus on human interaction</p>	<p>1.Lack of clear project based roadmap</p> <p>2.Lack of linkage to financial performance</p> <p>3.Not focus on leadership</p> <p>4.Lack of methodology to sustain results</p> <p>5.Lack of structured training programme</p> <p>6.No linkage between manufacturing improvement activities and business strategies (may lead to over capacity dilemma)</p>
<b>Critical success factors</b>	<p>Consensual view in the UK and the US on these ten factors:</p> <ol style="list-style-type: none"> <li>1.People and customer management</li> <li>2.Supplier partnerships</li> <li>3.Communication of improvement information</li> <li>4.Customer satisfaction orientation</li> <li>5.External interface management</li> <li>6.Strategic quality management</li> <li>7.Teamwork structures for improvement</li> <li>8.Operational quality planning</li> <li>9.Quality improvement measurement system</li> <li>10.Corporate quality culture</li> </ol> <p>The most important TQM factor is number six which emphasised the top management commitment (<i>Dayton 2003; Black &amp; Porter 1996</i>)</p>	<ol style="list-style-type: none"> <li>1.The processes of audit, review and assessment is a fundamental element to ensure the improvements</li> <li>2.Management support and participation</li> <li>3.Training</li> <li>4.Effective correction and prevention action</li> <li>5.Effective employee communications&amp; feedback</li> </ol>	<ol style="list-style-type: none"> <li>1.Strong leadership capability</li> <li>2.Clear objective and Roles &amp; Responsibility</li> <li>3.Open and direct communication</li> <li>4.Abilities to utilise primary tools (training)</li> <li>5.True understanding in the manufacturing processes</li> </ol>

**Appendix 4: Comparisons in core elements of Dramatic Improvement (Six Sigma, BPR)**

Elements	Direct Improvements	
	Dramatic Improvements	
	Six Sigma	BPR
<b>Philosophy</b>	1) Business and management philosophy 2) View all works as processes which can be improved by fact based and data driven approach	Business transformation, change existing business practices and redesign critical processes
<b>Aims</b>	1.Process Improvement: Reducing process variations, Re-structuring of an organisation (fundamental cultural change), Developing people, and improving innovative rate 2. Building robust design (DFSS)	Increase productivity and reduce cost by eliminating organisation's inefficiency-inefficient workforces, non value added processes, process variations and wastes
<b>Principles</b>	1.Process Management 2.Focusing on customer 3.Focusing on business impact and financial results 4.Basing decision on quantitative data 5.Basing improvement methodology on DMAIC or DMADV	1.Focusing on critical business processes and customers where dramatic and rapid changes is needed. 2.Discontinuous thinking 3.Radical redesign 4.Process-oriented thinking
<b>Methodology/ Roadmap</b>	Project based approach utilising 1.Process Improvement: Define, Measure, Analyse, Improve, Control (DMAIC)  2.Design For Six Sigma (DFSS):Define, Measure, Analyse, Design, Verify (DMADV)	1.Identifying problems 2.Establishing re-design team 3.Understand, Analysing and document processes 4.Innovation and rebuilding 5.Re-organising and retaining new standard 6.Measuring performance of new process 7.Continuous re-design and improvement across the entire organisation ( <i>DTI 2004b</i> )
<b>Tools</b>	1.Process Improvement tools: Brainstorming, Process mapping (identify VA and non VA), Pareto analysis, cause&effect diagram, DOE, PFMEA etc. 2.Statistical tools: Hypothesis testing, ANOVA, control chart, capability analysis, regression analysis etc.	1.Process Mapping/ process flowchart 2.Benchmarking 3.Process innovation 4.Simulation 5.IT 6.Activity Base Costing
<b>Participants</b>	Champions, Master Black Belts, Black Belts, Greenbelts, Yellow Belts (Project owners)	Process owners

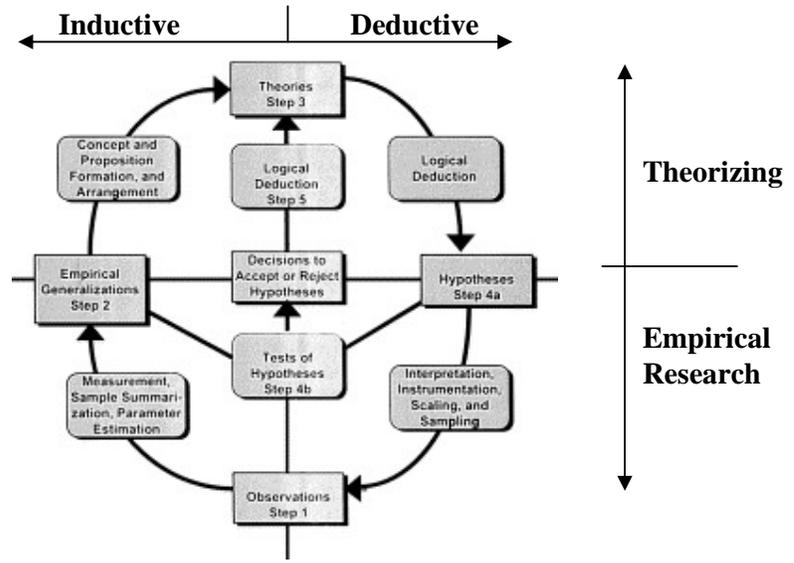
Elements	Direct Improvements	
	Dramatic Improvements	
	Six Sigma	BPR
<b>Strengths</b>	<ol style="list-style-type: none"> <li>1.Rigorous, formalised, systematic and practical methodology for company-wide quality improvement and being able to link with quality tools (comprehensive quality tool box)</li> <li>2.Rich in root causes analysis or preliminary analysis before implementation</li> <li>3.Measurable bottom-line results and rigorous financial evaluation (Business results oriented)</li> <li>4.Base decisions on facts and data</li> <li>5.Motivate intensive trainings</li> <li>6.Reduce cultural differences by using common method and terminology</li> <li>7.Enable breakthrough improvement</li> </ol>	<ol style="list-style-type: none"> <li>1.Reduce headcounts</li> <li>2.Break down the communications barrier across supply chains</li> <li>3.Fast, flexible and accessible information</li> <li>4.Transparent business processes</li> <li>5.Build decentralized, flat structure, wider span of control by using IT to tighten the control,</li> </ol>
<b>Weaknesses</b>	<ol style="list-style-type: none"> <li>1.Resources and time consuming in each project</li> <li>2.High investments in trainings, piloting</li> <li>3.Rewards and recognition emphasised on the individual</li> <li>4.Lack of standard in entitle Black-Belt, Green-Belt and their training programme (Varying and taloring instruction)</li> <li>5.Create six-sigma bureaucracy</li> <li>6.Lack of true financial savings</li> <li>7.Focusing on Critical-To-Quality (CTQ) to avoid customer dissatisfaction but less in innovating customer satisfaction or attractive quality (Not a solution for breakthrough strategy)</li> <li>8.Most six-sigma projects were narrowly focused, concentrating on small-scale, project oriented and problem solving activities; hence, it is not all for business transformation (Hammer, 2002)</li> <li>9.Lack of methodology to sustain results</li> </ol>	<ol style="list-style-type: none"> <li>1.Lack of tools and step-by-step approach to manage the change process</li> <li>2.Inability IT causes non-effectiveness system</li> <li>3.Ineffective communication leads to unsuccessful changes</li> <li>4.Isolating initiatives without evaluating of possibility and monitoring continuously lead to fail in executions and sustain new results</li> </ol>
<b>Critical success factors</b>	<ol style="list-style-type: none"> <li>1.Management involvement and commitment</li> <li>2.Cultural change (increase communication, motivation and education)</li> <li>3.Communication</li> <li>4.Organisation infrastructure(enough resources&amp;investments)</li> <li>5.Intensive training</li> <li>6.Link six sigma to business strategy, customer,human resources, suppliers</li> <li>7.Understand tools and techniques within six sigma</li> <li>8.Project management skills</li> <li>9.Project prioritization and selection (Antony &amp; Banuelas 2002)</li> </ol>	<ol style="list-style-type: none"> <li>1.Effective leadership and project management skill</li> <li>2.Ability to cope with organisational dynamics</li> <li>3.Effective communication</li> <li>4.Effectiveness of IT infrastructure which required experienced IT experts</li> <li>5.Continuously monitor IT performance</li> <li>6.Management competency and support</li> </ol>

**Appendix 5: Comparisons in core elements of Internal and External assessments (Balanced Scorecard, Self-assessment by MBNQA, EFQM and Benchmarking)**

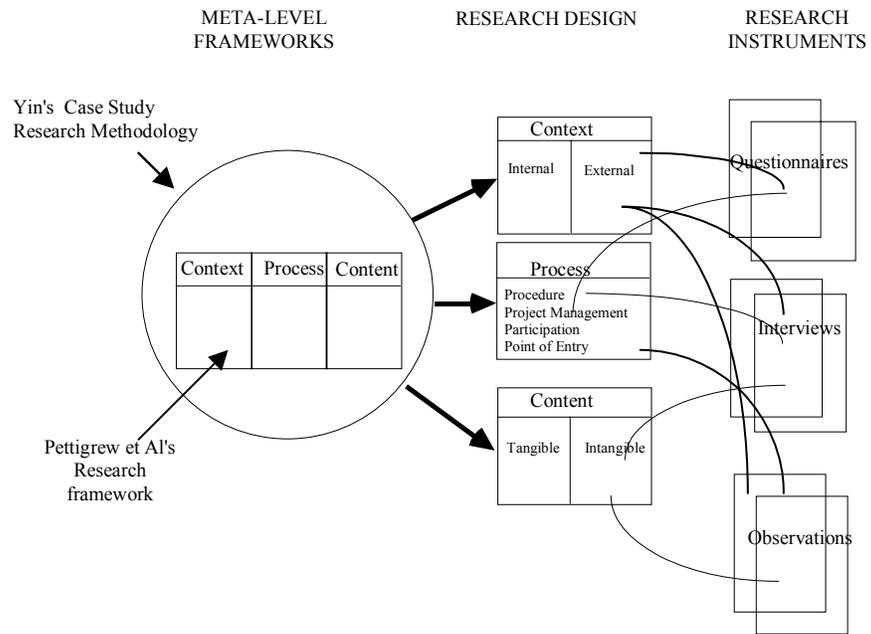
Elements	Indirect Improvement			
	Internal Assessment			External Assessment
	Balanced Scorecard	Self-assessment by MBNQA	Self-assessment by EFQM	Benchmarking
<b>Philosophy</b>	Performance measurement system	Pursuing the US quality awards or world-class standards	Driving business improvement and become an organisational excellence or pursue the EU quality award	Pursuing the best in class
<b>Aims</b>	1.Reflect strategy of the organisation 2.Measure the effectiveness which incorporates tangible and intangible assets 3.Identify opportunities for optimizing profitability and growth	1.Position the improvement opportunities (gap analysis) to enable business performance improvement 2.Organisational control system	Position the improvement opportunities (gap analysis) to enable business performance improvement 2.Organisational control system	Continuous learning from best practices, adapt and improve to fit the organisation
<b>Concepts</b>	1.Translate the strategy to operational terms 2.Align organisation to strategy 3.Make strategy everyone's everyday job 4.Make strategy a continual process <i>(Kaplan&amp;Norton 2001,pp.9-15)</i>	Framework for performance improvement model through the U.S. quality award criteria, which is used to motivate TQM	Framework for performance improvement model through organisational excellence and European quality award criteria, which is used to motivate TQM	Measuring and comparing key business performance against the best in class as an impetus to improve performance continuously
<b>Methodology/Roadmap</b>	1.Identify improvement opportunities which are linked to strategic success 2.Search for improvement methods	1.Internally assess an organisation according to the MBNQA framework to identify the improvement opportunities 2.Search for improvement methods	1.Internally assess an organisation according to the EFQM framework to identify the improvement opportunities 2.Search for improvement methods	1. Identifying Critical Success Factor-CSFs which affect the overall competitiveness to be benchmarked 2.Collecting internal data and benchmark partners 3.Analysing data-identify performance gaps and process enablers 4.adapting and improving <i>(Joyce, M.E. 1995, pp.222-225)</i>
<b>Tools</b>	1.A balanced scorecard composes of four perspectives: financial, customer, business process, and learning and growth 2.Benchmarking	Baldrige criteria composes of seven categories allocated with the total of 1000 scorepoints. Seven criteria for performance excellence under four basic elements are (1) driver (leadership), (2) system (strategic planning, information and analysis, HR focus, and Process management), (3) measures (quality and operational results), and (4) goal (customer focus).	EFQM excellence model consists of nine primary areas under two categories of 'Results' with respect to (1)Performance, (2)Customers, (3)People, (4)Society which achieve through 'Enablers' (5)Leadership driving (6)Policy&strategy that is delivered through (7)People, (8)Partnerships&Resources and (9)Processes.	Process flowcharts, questionnaire, survey, benchmark table
<b>Participants</b>	Executives, top management	Everybody in the organisation	Everybody in the organisation	Project owners

Elements	Indirect Improvement			
	Internal Assessment			External Assessment
	Balanced Scorecard	Self-assessment by MBNQA	Self-assessment by EFQM	Benchmarking
<b>Tools</b>	1.A balanced scorecard composes of four perspectives: financial, customer, business process, and learning and growth 2.Benchmarking	Baldrige criteria composes of seven categories allocated with the total of 1000 scorepoints. Seven criteria for performance excellence under four basic elements are (1) driver (leadership), (2) system (strategic planning, information and analysis, HR focus, and Process management), (3) measures (quality and operational results), and (4) goal (customer focus).	EFQM excellence model consists of nine primary areas under two categories of 'Results' with respect to (1)Performance, (2)Customers, (3)People, (4)Society which achieve through 'Enablers' (5)Leadership driving (6)Policy&strategy that is delivered through (7)People, (8)Partnerships&Resources and (9)Processes.	Process flowcharts, questionnaire, survey, benchmark table
<b>Participants</b>	Executives, top management	Everybody in the organisation	Everybody in the organisation	Project owners
<b>Strengths</b>	1. Identify improvement opportunities which are critical to strategic success 2. Enhance process-focused strategies by identifying both financial and non financial measures 3. Link operational improvements to the expected outcomes in customers or financial perspectives	1. Give feedback of strength and Identify specific improvement opportunities according to quality award criteria 2. Provide clear purpose and direction 3. Motivate quality awareness 4. Comprehensive, systematic, and internationally recognised framework 5. Use to disseminate best practices across the U.S.	1. Create a culture of improvement 2. Give feedback of its strengths and Identify specific improvement opportunities according to organisational excellence model 3. Provide clear purpose and direction 4. A pioneer to integrate quality model with the organisational model which increase quality awareness 5. Comprehensive, systematic, and internationally recognised framework	1. Create a culture for continuous improvement 2. Identify specific improvement opportunities from the best practices and pursue the best in class 3. Low investments 4. Logical and simple method (easy to follow)
<b>Weaknesses</b>	1. Problems of BSC implementation which fail to deliver expected benefits 2. Lack of improvement methodology	1. At the beginning self-assessment motivate and produce improvement but its rate of improvement is slower gradually. 2. Lack of improvement methodology	1. At the beginning self-assessment motivate and produce improvement but its rate of improvement is slower gradually. 2. Lack of improvement methodology	1. Lack of structured improvement methodology and tools which lead to become the best in class 2. Easily loose its improvement focus after the previous benchmark
<b>Critical success factors</b>	1. Executive leadership 2. Explicit strategies	1. Management support 2. Regular assessment 3. Truly understand the criteria and one's own organisation	1. Management support 2. Regular assessment 3. Truly understand the criteria and one's own organisation	1. Senior management support 2. Team base approach 3. Well plan, organise and manage benchmarking process 4. True understanding in one's own process/ organisation

**Appendix 6: The scientific theory-building process (Wallace 1971, p.18)**



**Appendix 7: The research structure in OM field (Platts et al. 2001)**



**Appendix 8: Semi-structured interview (Group 1: Academics/ Consultants)**

**Structured Interview with Academics/ Consultants**

**Introduction**

To become a world-class organisation, continuous improvement (CI) in key operating dimensions of cost, quality, productivity, flexibility, and process innovation is necessary to regain and maintain a competitive advantage in the global market. Hence, many organisations invest a considerable amount of capital and resources implementing new techniques to improve their operating performance. Typical approaches include TQC/TQM, Six Sigma, Business Process Reengineering, and excellence self-assessment according to quality awards (MBNQA, EFQM, Deming prize, TQA etc). An effective strategy for selecting and implementing a CI approach is an important issue to ensure stakeholder satisfaction.

Objectives of the interview with Group 1: Experts

1. To investigate current suggested CI programmes, which you would recommend.
2. To understand the consultants’ methodologies for selecting CI programmes
3. To discuss underlying principles, and current practices in selection approach
4. To identify relevant factors and criteria to be considered in selecting CI programmes
5. To acquire new ideas and discuss the development of a structured selection approach

**Part 1: Details of the interviewee (name, institution and areas of research or expertise)**

Name: .....Institution: .....  
 Areas of research or expertise (related to quality improvement/ management): .....

1. Do you agree with the above pre-mentioned statement that ‘quality’ is an important issue in business and CI is necessary for business’s health and will lead to business excellence and a world-class organisation?
  - a) No. Why and what should be substitute continuous improvement?  
 .....
  - b) Yes. What would be your suggested programme or activity to pursue continuous quality improvement?  
 TQM             Six sigma             ISO9001             Lean  
 BPR  
 Excellent-self assessment (MBNQA, EFQM, Deming prize, TQA etc.)  
 Others .....
2. Which quality improvement programme have you recommended and what are the reasons for undertaking these improvement programmes?

Yes	Quality Improvement programs	Reasons (Use number below)
<input type="checkbox"/>	TQM (QCC, Suggestion system, 5S etc.)	
<input type="checkbox"/>	ISO9001: 2000	
<input type="checkbox"/>	Six Sigma / Process Excellence	
<input type="checkbox"/>	Lean production	
<input type="checkbox"/>	Business Process Reengineering	
<input type="checkbox"/>	Excellent Self-assessment (MBNQA, EFQM, Deming prize, Thailand Quality Awards)	
<input type="checkbox"/>	Benchmarking	

- |   |                                     |
|---|-------------------------------------|
| 1) Improve productivity                   | 2) Improve product/ service quality |
| 3) Improve organisation’s competitiveness | 4) Improve process/ working system  |
| 5) Cost reduction                         | 6) Improve financial performance    |

- |                                    |                                 |
|------------------------------------|---------------------------------|
| 7) Enhance customer's satisfaction | 8) Create company's reputation  |
| 9) Employee development            | 10) Reduce amount of resources  |
| 11) Increase quality awareness     | 12) Increase work participation |
| 13) Increase export sales          | 14) Increase Thai market sales  |
| 15) Others                         |                                 |
- .....

3. Do you think these improvement programmes are suitable for Thai culture? Why or why not?

.....

4. What are the major factors driving improvement in the organisations with which you have worked?

.....

5. What are the barriers to drive improvement in the organisations with which you have worked?

.....

**Part 2: Current approach for selecting quality improvement program**  
**(E.g. TQM, Six Sigma, ISO9001, Lean manufacturing, BPR, Excellence-self assessment)**

6. Do you have a structured methodology for selecting a suitable CI programme for an organisation?

If 'Yes' then

6.1 What are the steps involved in decision-making?

.....

6.2 What are the factors and criteria do you use for consideration? Why do you consider them?

.....

6.3 How do you prioritise your factors?

.....

6.4 How many people are involved in the decision-making? Who are they?

.....

6.5 What are the difficulties typically encountered throughout your decision-making process?

.....

6.6 How are those difficulties overcome?

.....

6.7 How long does it take to decide which CI programme is most appropriate?

.....

6.8 What are the strengths and weaknesses of your current approaches?

Strengths:.....

.....

Weaknesses:.....

.....

If 'No' then

7. How do you choose those CI programmes?

- Requested by organisation
- Recommended by  Consultants  Customers  Suppliers  Contacts (outside organisation)  Best practices  Books/Journal articles  News/ websites
- Company's research/ improvement team
- Others .....

8. Do you think that it is better to have a structured methodology for CI programme selection? Why and how important it is?
- Reduce cost       Reduce time       Reduce complexity in decision-making
- Select the right programme for the needs       Reaction to market condition
- Enhance confidence in implementation
- Others .....

**Part 3: Suggestions for developing deployment and structured approach and criteria for decision-making**

9. What do you expect from decision aid for selecting CI programme?
- .....
- .....

10. What is your suggestion for a practical decision-aid approach (framework/process)?
- Easy to use and understand       Computer support tool
- Step-by-step approach       Customise company specific requirements
- Documentation       Link to current company's strategies
- Others.....
- .....

11. What are the key factors to be considered in CI programme selection? Should the factors below be used for judgment and what else should be incorporate?
- Company needs (Current practice versus Target)       Company's strategies
- Company capability
- Company's history in quality improvement programme
- Others .....

12. What are the criteria to be considered in judging the CI programme? Please put your degree of agreement in number as follows  
(Not significant =0, Yes with low =1, Medium =2, High=3)

Criteria	Sub-Criteria	Yes/No (Degree of agreement)	
Shareholders	Increase stockmarket price		
Firm's performance	Financial performance	% Changes in sales	
		Return on assets (profitability)	
		Return on sales	
		Changes in total assets	
		Revenue/ turnover growth	
		Cost reduction	
	Quality performance (Product/service nonconformities)		
	Operating performance (Productivity)		

Criteria	Sub-Criteria	Yes/No (Degree of agreement)
Marketing performance	Market share/ Brand recognition	
	Internationally recognized standard for organisational QMS	
Customers	Customer's satisfaction	
Human resources	% Change in number of employees	
	Amount of resources	
	Dexterity or flexibility of workman (Knowledge skills)	
	Provide rewards and recognition scheme	
Process Improvement	Process innovation breakthrough	
	Reduce process variability, create process stability, stable variation, process predictability and control	
	Provide formalised, systematic and practical improvement methodology	
	Provide a set of quality improvement tools	
	Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	
	Foundation for process record for tractability, maintainable systems	
	Improve workflow, reduce Non Value Added activities, and waste	
	Create fast, flexible, and accessible information (transparent business processes)	
	Enhance inventory management	
	Monitoring process improvement progress	
Organisation	Fashionable technique! Company image	
	Improve competitiveness, effectiveness and flexibility of a whole organisation	
	Build a foundation for continuous improvement and sustainable org.	
	Create agile and learning organisation	
	Not interrupting operations or not require involvement from the whole organisation	
	Motivate intensive trainings	
	Improve organisational culture, R&R	
	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)	
	Accelerate and maintain organisational improvement efforts, and energize employees	
	Motivate quality awareness and increase total participations in improving organisation	
Resource consumption	Resource and time consuming	
	High investments	

Criteria	Sub-Criteria	Yes/No (Degree of agreement)
Impact to organisation	No instruction of which tools to be used when and how	
	Quality performance will not improve If the followed processes are not suitable for product/services.	
	Not cover all requirements for business improvement criteria (MBNQA)	
	Focus on whole organisation rather than functions	
	Large transformation and cultural change	
	Focus too much on process not enough on practice or people	
	Too slow to face with rapid changing competitive requirement	
Critical success factor	Should extended to company's supply chain to maximise program	
	Top management commitment	
	Effective communication and feedback	
	Effective team working, people engagement and empowerment	
	Others (Please specify)..... ..... ..... .....	

13. What other criteria would you recommend to be incorporated?

.....  
.....  
.....

**Appendix 9: Semi-structured interview (Group 2: Industrialists in top management/senior managers)**

**Structured Interview with Industrialists  
(Top management, Senior managers, QMR, Departmental managers)**

**Introduction**

To become a world-class organisation, continuous improvement (CI) in key operating dimensions of cost, quality, productivity, flexibility, and process innovation is necessary to regain and maintain a competitive advantage in the global market. Hence, many organisations invest a considerable amount of capital and resources implementing new techniques to improve their operating performance. Typical approaches include TQC/TQM, Six Sigma, Business Process Reengineering, and excellence self-assessment according to quality awards (MBNQA, EFQM, Deming prize, TQA etc). An effective strategy for selecting and implementing a CI approach is an important issue to ensure stakeholder satisfaction.

Objectives of the interview with Group 2: Top management team in case companies

1. To discuss the introduction: Is CI choice an important issue in industry?
2. To understand the development of continuous quality improvement activities, their effectiveness and impact on the organisation.
3. To understand how CI selection decisions are made in current practice and discuss underlying principles and selection approaches.
4. To identify relevant factors and criteria to be considered in selecting CI programmes.
5. To acquire new ideas and discuss the development of a structured selection approach.

**Part 1: Company details**

Company Name:

.....

Company address:.....

Telephone:.....

Is the company 100% Thai owned? a) Yes      b) 100% foreign own  
(nationality).....

b) Joint Venture (please specify nationality)

.....

Type of industry:  Service  Manufacturing

Type of product/service.....

Total number of employees .....

Capital investment:  less than 50 Mbaht  50 Mbaht -100 Mbaht  more than 100 Mbaht

Percentage of total exported sales:  0%  1-25 %  26-50 %  51-75%  76-100%

Achieve Quality Awards (Y/N):.....which quality awards? .....

Total number of qualified internal auditors .....

Green Belt ....., Black Belt ....., Master Black Belt.....

QCC facilitators....., CI coordinators....., others.....

**Part 2: Continuous improvement and company's practice in quality improvement program**

1. Do you agree with the above pre-mentioned statement that 'quality' is an important issue in business and CI is necessary for business's health and will lead to business excellence and a world-class organisation?

a) No. Why and what should be used instead of continuous improvement?

b) Yes. What would be your suggested programme or activity to pursue continuous quality improvement? Could you also explain CI activities in your organisation?

- TQM                       Six sigma                       ISO9001                       Lean  
 BPR                       Excellence self-assessment (MBNQA, EFQM, Deming prize, TQA)  Others CI activities:.....

2. Which quality improvement programme has your organisation used to drive improvement and what are the reasons for undertaking these improvement programmes?

Y	Quality Improvement programs	Start in (DD/MM/YY)	Stop in (DD/MM/YY) /Frequency of implement	Slow down in/ why?	Future plan to implement in two years' time (Y/N)	Reason to implement (Use numbers below)
<input type="checkbox"/>	TQM (QCC, Suggestion system, 5S etc.)				Yes / No	
<input type="checkbox"/>	ISO9001				Yes / No	
<input type="checkbox"/>	Six Sigma / Process Excellence				Yes / No	
<input type="checkbox"/>	Lean production				Yes / No	
<input type="checkbox"/>	Business Process Reengineering				Yes / No	
<input type="checkbox"/>	Excellence Self-assessment (MBNQA, EFQM, Deming prize, Thailand Quality Awards)				Yes / No	
<input type="checkbox"/>	Benchmarking				Yes / No	

- |   |                                     |
|---|-------------------------------------|
| 1) Improve productivity                   | 2) Improve product/ service quality |
| 3) Improve organisation's competitiveness | 4) Improve process/ working system  |
| 5) Cost reduction                         | 6) Improve financial performance    |
| 7) Enhance customer's satisfaction        | 8) Create company's reputation      |
| 9) Employee development                   | 10) Reduce amount of resources      |
| 11) Increase quality awareness            | 12) Increase work participation     |
| 13) Increase export sales                 | 14) Increase Thai market sales      |
| 15) Fashionable programme (Company image) | 16) Others .....                    |

3. How effective have these programmes been in achieving continuous improvement in your organisation?

Quality Improvement programmes	Estimate the cost of implementing [Set up cost, Annual cost] (THB)	Estimate time for implementing [From start to be able to fully run] (Month)	Level of satisfaction					
			No practice	Not at all effective	Not very effective	Moderate	Effective	Very effective
TQM (QCC, Suggestion system, 5S etc.)			0	1	2	3	4	5
ISO9001:2000			0	1	2	3	4	5

Six Sigma / Process Excellence			0	1	2	3	4	5
Lean production			0	1	2	3	4	5
Business Process Reengineering			0	1	2	3	4	5
Excellence Self-assessment (MBNQA, EFQM, Deming prize, Thailand Quality Awards)			0	1	2	3	4	5
Benchmarking			0	1	2	3	4	5

4. What CI or quality management tools are you using now in your company?  
.....
5. Do you think these improvement programmes are suitable to Thai culture? Why or why not?  
.....
6. What are the major factors, which drive improvement in your organisation?  
.....
7. What are the main barriers to improvement in your organisation?  
.....

**Part 3: Current approach for selecting quality improvement program (TQM, Six sigma, ISO9001, Lean, BPR, Excellent-self assessment)**

8. Do you have a structured methodology for selecting CI programme?
- If 'Yes' then
- 8.1 What are the steps involved in decision-making?  
.....
- 8.2 What are the factors and criteria do you use for consideration? Why do you consider them?  
.....
- 8.3 How do you prioritise your factors?  
.....
- 8.4 How many people involve in the decision-making? Who are they?  
.....
- 8.5 What are the difficulties typically encountered throughout your decision-making process? How are those difficulties overcome?
- | Difficulties | Action taken to overcome them |
|--------------|-------------------------------|
| ▪ .....      | .....                         |
| ▪ .....      | .....                         |
- 8.6 How long does it take to decide which CI programmes?  
.....
- 8.7 What are the strengths and weaknesses of your current approaches?  
Strengths:.....  
Weaknesses:.....

- If 'No' then
9. How do you choose those CI programmes?
- Requested by organisation
- Recommended by

- Consultants Cost of consultation..... Baht,  
Time for programme selection.....day(s)
- Customers       Suppliers       Contacts (outside organisation)
- Best practices     Books/Journal articles     News/ websites
- Company's research/ improvement team
- Others .....

10. Do you think that it is better to have a structured methodology for selection? Why and how important it is?

- Reduce cost       Reduce time       Reduce complexity in decision-making
- Select the right programme for the needs     Reaction to market condition
- Enhance confidence in implementation
- Others .....

**Part 4: Suggestions for developing deployment and structured approach and criteria for decision-making**

11. What do you expect from decision aid for selecting CI programme?

.....

12. What is your suggestion for a practical decision-aid approach (framework/process)?

- Easy to use and understand       Computer support tool
- Step-by-step approach       Customise company specific requirements
- Documentation       Link to company's strategies

Others.....

.....

13. What are the key factors to be considered in CI programme selection? Should the below factors be used for judgment and what else should be incorporate?

- Company needs (Current practice versus Target)       Company's strategies
- Company capability
- Company's history in quality improvement programme
- Other constraints.....

14. What are the criteria to be considered in judging the CI programme? Please put your degree of agreement in number as follows (Not significant =0, Yes with low =1, Medium =2, High=3)

Criteria	Sub-Criteria	Yes/No (Degree of agreement)
Shareholders	Increase stockmarket price	
Firm's performance	Financial performance	% Changes in sales
		Return on assets (profitability)
		Return on sales
		Changes in total assets
		Revenue/ turnover growth
		Cost reduction
	Quality performance (Product/service nonconformities)	
	Operating performance (Productivity)	

Criteria	Sub-Criteria	Yes/No (Degree of agreement)
Marketing performance	Market share/ Brand recognition	
	Internationally recognized standard for organisational QMS	
Customers	Customer's satisfaction	
Human resources	% Change in number of employees	
	Amount of resource usage (e.g. space, capital, labour)	
	Dexterity or flexibility of workman (Increase knowledge skill)	
	Provide rewards and recognition scheme to human resource	
	Employees' attitude to organisation (Royalty, negative feedback)	
Process Improvement	Process innovation breakthrough	
	Reduce process variation, create process stability, process predictability and control	
	Provide formalised, systematic and practical improvement methodology	
	Provide a set of quality improvement tools	
	Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	
	Foundation for process record for tractability, a maintainable system	
	Improve workflow, reduce Non Value Added activities, and waste	
	Create fast, flexible, and accessible information (transparent business processes)	
	Enhance inventory management	
	Monitoring process improvement progress	
Organisation	Fashionable technique! Company image	
	Improve competitiveness, effectiveness and flexibility of a whole organisation	
	Build a foundation for continuous improvement	
	Create agile and learning organisation	
	Not interrupting operations or not require involvement from the whole organisation	
	Motivate intensive trainings	
	Improve organisational culture, R&R	
	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)	
	Accelerate and maintain organisational improvement efforts, and energize employees	
	Motivate quality awareness and increase total participations in improving organisation	
Resource consumption	Resource and time consuming	
	High investments	

Criteria	Sub-Criteria	Yes/No (Degree of agreement)
Impact to organisation from implementation	No instruction of which tools to be used when and how	
	Quality performance will not improve If the followed processes are not suitable for product/services.	
	Not cover all requirements for business improvement criteria (MBNQA)	
	Focus on whole organisation rather than functions	
	Large transformation and cultural change	
	Focus too much on process not enough on practice or people	
	Too slow to face with rapid changing competitive requirement	
Critical success factor	Should extended to company's supply chain to maximise program	
	Top management commitment	
	Effective communication and feedback	
	Effective team working, people engagement and empowerment	
	Others (Please specify)..... ..... ..... .....	

15. What other criteria would you recommend to be incorporated?

.....  
.....

**Appendix 10: Semi-structured interview (Group 3: Industrialists in QI team/technicians)**

**Structured Interview with Case Companies  
(Quality Improvement teams, Technicians, and Operators)**

Objectives of the interview with Group 3: QM team in case companies

1. To investigate employees' understanding of continuous improvement and quality improvement programmes
2. To understand employee attitudes towards improvement programmes

**Part 1: Continuous improvement and company's practice in quality improvement program**

1. What quality improvement programmes do you currently pursue?

- TQM                       Six sigma                       ISO9001                       Lean  
 BPR                       Excellence self-assessment (MBNQA, EFQM, Deming prize, TQA etc.)  
 Others .....

2. What quality tools or techniques do you currently employ?

- 7 QC tools                       7 Management tools                       SPC/ Control chart  
 QFD                       FMEA                       DOE                       Process mapping  
 5 S                       Others .....

3. Do you think continuous improvement of the quality of the company's products/ services is important for the company's growth and competitiveness? Why?  
 .....

4. What make you enjoy working in quality improvement activities?  
 .....

5. What motivate you to participate in quality improvement activities?  
 .....

6. What are the difficulties encountered in your quality improvement activities? How those difficulties were overcome?

Difficulties	Action taken to overcome them
.....	.....
.....	.....

7. How many hours per week do you spend in quality improvement programme?  
 .....

8. Please indicate when and how the main part of the improvement work is carried out. The work take place:

- |   |  |
|---|--|
| <b>When:</b> <input type="checkbox"/> Regular work time<br><input type="checkbox"/> Paid overtime<br><input type="checkbox"/> Unpaid overtime | <b>How:</b> <input type="checkbox"/> Dedicated CI meetings<br><input type="checkbox"/> Regular work meetings<br><input type="checkbox"/> Spontaneous, one-off meetings<br><input type="checkbox"/> As an individual activity |
|---|--|

9. How many suggestions have you made per year? Please circle below.

0	1	2	3	4	5	6	7	8	9	10	11	12	>12
---	---	---	---	---	---	---	---	---	---	----	----	----	-----

10. How many hours of training per year do you typically receive?  
 .....

**Part 2: Employee attitude towards quality improvement programme**

11. What are your opinions towards these improvement programmes? Please tick below if it is true to you.

No.	Employee's attitude on quality improvement programme	Not at all	Less	Moderate	Much	Very much
1	Reduce product/service nonconformities or defects	1	2	3	4	5
2	Increase productivity	1	2	3	4	5
3	Reduce amount of resource usages (Time/ people/ materials etc)	1	2	3	4	5
4	Increase dexterity or flexibility of workman	1	2	3	4	5
5	Provide rewards and recognition	1	2	3	4	5
6	Reduce process variability, create process stability, stable variation, process predictability and control	1	2	3	4	5
7	Provide formalised, systematic and practical improvement methodology	1	2	3	4	5
8	Provide a set of quality improvement tools	1	2	3	4	5
9	Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	1	2	3	4	5
10	Foundation for process documentation, maintainable systems	1	2	3	4	5
11	Improve workflow, reduce NVA, and waste	1	2	3	4	5
12	Create fast, flexible, and accessible information (transparent business processes)	1	2	3	4	5
13	Enhance inventory management	1	2	3	4	5
14	Monitoring process improvement progress	1	2	3	4	5
15	Improve competitiveness, effectiveness and flexibility of a whole organisation	1	2	3	4	5
16	Build a foundation for continuous improvement	1	2	3	4	5
17	Create agile and learning organisation	1	2	3	4	5
18	Not interrupting operations or not require involvement from the whole organisation	1	2	3	4	5
19	Motivate intensive trainings	1	2	3	4	5
20	Improve organisational culture, R&R	1	2	3	4	5
21	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)	1	2	3	4	5
22	Accelerate and maintain organisational improvement efforts, and energize employees	1	2	3	4	5
23	Motivate quality awareness and increase total participations in improving organisation	1	2	3	4	5
24	Resource and time consuming (distract and increase your workload?)	1	2	3	4	5

No.	Employee's attitude on quality improvement programme	Not at all	Less	Moderate	Much	Very much
25	High investments on each projects or on implementation	1	2	3	4	5
26	No instruction of which tools to be used when and how	1	2	3	4	5
30	Large transformation and cause cultural change	1	2	3	4	5
31	Focus too much on process not enough on practice or people	1	2	3	4	5
32	Too slow to face with rapid changing competitive requirement	1	2	3	4	5
33	Top management commitment is important	1	2	3	4	5
34	Effective communication and feedback are important	1	2	3	4	5
35	Effective team working, people engagement and empowerment are important	1	2	3	4	5
36	Others (please specified) ..... .....	1	2	3	4	5

## Appendix 11: List of interviewees

Interviewees Group 1: Experts, Academic, and Consultant in Thailand						
No.	Interviewees	Institution	Position	Category	Interview Date	Duration (Hours)
E.1	Assoc.Prof.Damrong Thawesaengskulthai	IE department, Chulalongkorn University	Head IE department and Chief Quality Officer for AUN-QA/ Chairman of ISO9000 standard Thailand	Academic	14 Jan 05, 3 May 05	2 hrs
E.2	Assoc.Prof. Parames Chutima	IE department, Chulalongkorn University	Assoc.Prof. In quality, Chulalongkorn University	Academic	18-Jan-05	1 hr
E.3	Prof. Pakorn Adulpan	Science and Technology expert in Thailand	Vice Chairman of F.T.I, Chairman of Science and Technology Committee, Chairman of R&D for Industry Institute, and Managing Director of Thai Laminate Manufacturer Co.,Ltd.	Academic	6-Mar-05	1.5 hrs
E.4	Mr.Sangvorn Rutnarak	Thailand Productivity Institute	Deputy Executive Director of Thailand Productivity Institute	Consultant	25-Jan-05	2.5 hrs
E.5	Mr.Steve Warwood	Warwick University	SJW Associates, Consultancy& Training (Part of Warwick University)	Consultant	5-Mar-05	1 hr
E.6	Ms.Doungtip	Thailand Productivity Institute	Quality Financial for Six Sigma and a Master Black Belt of GE for 5 yrs	Consultant	17-Feb-05	2 hrs
E.7	Assoc.Prof.Paritud Bhandhubanyong	National Science and Techonology Development Agency	Director of National Metal and Material Technology Center, NSTDA, Ministry of Science and Technology	Expert	27-Jan-05	1.5 hrs
E.8	Dr.Ladawan Krasachol	National Science and Techonology Development Agency	Director of Planning and Budgeting Department, National Science and Techonology Development Agency (NSTDA)	Expert	25-Mar-05	1 hr
E.9	Dr.Pirom Chamsai	TQM best practice Thailand	Chief Executive Officer of Consulting& Management 49 Limited and a committee of TQM best practice Thailand	Expert	15-Feb-05	1.5 hrs
E.10	Mr.Anond Paweenawat	Former director of TQPC of SCG	Advisor to Chairman of Executive board on SCM&TQM and a former Director of Corporate Total Quality Promotion Center at Siam Cement	Expert	15-Feb-05	4 hrs
E.11	Mr.Chaiyong Krittapholchai	Ministry of Industry	Director of Office of the National Accreditation Council, Ministry of Industry	Expert	4-Feb-05	2 hrs
E.12	Mr.Pattanachai Kulasiriswad	TQM best practice Thailand	President of Chaiyaboon Brothers co.,LTD	Expert	2-Mar-05	2 hrs
E.13	Mr.Samard Hongvilai	TQM best practice Thailand	Assistant Senior Vice President, Corporate Management and Development Department of the Government Housing Bank	Expert	24-Mar-05	0.5 hr
E.14	Mr.Somchai Niradpardpongorn	TQM best practice Thailand	President of the SCI (Cast and Ductile Iron Valves)	Expert	14-Mar-05	1.5 hrs

Interviewees at two additional case companies					
Advance Info Service Public Co.,Ltd. (AIS)					
No.	Interviewee's name	Position	Category	Date	Duration
A1.1	Ms.Suwimol Kaewkoon	Chief Customer Champion&Terminal Busines Officer	Top management	20-Apr-05	1 hr
A1.2	Mr.Peravate Kijburana	Assistant Vice President Network Quality Management	Top management	21-Mar-05	1.5 hrs
A1.3	Mr.Werapong Chalermjirarat	Assistant Vice President Service Quality Management	Top management	16-Mar-05	2 hrs
A1.4	Mr.Pisit Pipatphokakul	Quality Assurance Specialist	Senior manager	16-Mar-05	2 hrs
Toyota Thailand					
T1.1	Ekachai Chaisiriphan	General Manager, Quality Assurance Department	Top management	24-Feb-05	1 hr
T2.1	Piyanut Kumaddee	Quality Assurance Engineering	Senior manager	24-Feb-05	1 hr

Interviewees Group 2 and Group 3: Three in-depth case companies						
The Siam Cement Group (SCG)						
No.	Interviewee's name	Business Unit	Position	Category	Date	Duration
C1.1	Mr.Cholathorn Dumrongsak	Corporate	Director, Corporate Total Quality Promotion Center	Top management	31 Jan 05, 21 Apr 05	2 hrs
C1.2	Mr.Kittinan Pora	Business unit 1 Petrochemical Business	Quality Management Manager	Top management	31-Jan-05	1.5 hrs
C1.3	Mr.Sasawat Dansamasatid	Business unit 2 Cemenhai building products CO., LTD	Organization Development Manager	Top management	31-Jan-05	1.5 hrs
C1.4.1	Mr.Pornchai Charoenchitseriwong	Business unit 3 Cement Business	Planning Manager	Top management	31-Jan-05	1.5 hrs
C1.4.2	Mr.Kidakorn Angkanarak		Quality Management Manager			
C1.5	Mr.Puttaporn Saengratanadej	Business unit 4 Paper&Packaging Business	Marketing Planning Department Manager	Top management	14-Feb-05	1.5 hrs
C1.6	Mr.Bunn Kasemsup	Business unit 5 Cemethai Distribution Company Limited	Business Planning Office Manager	Top management	31-Jan-05	1.5 hrs
C1.7	Mr.Somyot Tangmeelarp	Business under unit 3 The Siam Refractory Industry (SRIC)	Managing Director of The Siam Refractory Industry (SRIC)	Top management	14-Feb-05	1.5 hrs
C2.1	Mr.Somboon Uranukul		Production Manager at SRIC	Senior manager	22-Feb-05	1.5 hrs
C2.2	Mr.Vorayut Nedngam		Quality System Manager at SRIC	Senior manager	18-Feb-05, 22-Apr-05	4 hrs
C2.3	Mr. Prapas Kawepongpun		Human Resource Manager at SRIC	Senior manager	22-Feb-05	1.5 hrs
C3.1	SRIC TQM promoter/ Staff		SRIC TQM promoter or Staff level	26 person (manager, engineer, TQM promoter)	QI team	22-Feb-05
C3.2	SRIC employee	SRIC employee	15 person	QI team	22-Feb-05	-

The PTT public company limited						
No.	Interviewee's name	Business Unit	Position	Category	Date	Duration
P1.1	Mr.Somporn Mahissaya	Corporate	VP QSHE management department	Top management	2 Feb 05, 3 Feb 05 24 Feb 05	2 hrs
P1.2	Dr.Songkiert Tansamrit	Corporate	ผู้ช่วยกรรมการผู้จัดการใหญ่ แผนและกลยุทธ์องค์กร (Executive Vice President: Corporate Strategy and Planning)	Top management	7 Mar 05,	1.5 hrs
P1.3	Mr.Pitipan Teparimargorn	Corporate	ผู้ช่วยกรรมการผู้จัดการใหญ่ ทรัพยากรบุคคลองค์กร (Executive Vice President: Corporate HR)	Top management	24-Feb-05	1 hr
P1.4	Mr.Chadil Chavanalikhom	Office	QSHE Policy Division manager	Top management	2-Feb-05	1 hr
P2.1	Mr.Panit Srithanyarat	Office	QSHE Management Division Manager	Senior manager	3-Feb-05	1 hr
P2.2	Mr.Piti Srisuksobuth	Gas Business Group	QSHE manager (Gas Business Group)	Senior manager	2-Feb-05	1.5 hrs
P2.3	Mr.Kaitisak Siriwongsilp	Oil Business Group	QSHE manager (Oil Business Group)	Senior manager	1-Mar-05	1 hr
P3.1	Quality management representative and technical staff in Oil group	Oil Business Group	10 people (QC core, QMR, and Technical)	QI team	16-Feb-05	8 hrs
P3.2	Quality management working team in Gas business	Gas Business Group	7 people (เสนอผลงานเพิ่มผลผลิตประจำปี ณ.ศูนย์ปฏิบัติการชลบุรี)	QI team	28 Jan 05, 25 Feb 05	5 hrs
P3.3	Staff in the office	Office	3 people	QI team	21 Feb 05, 31 Mar 05	3 hrs

Johnson & Johnson manufacturing Thailand (JJTH)						
No.	Interviewee's name	Business Unit	Position	Category	Date	Duration
J1.1	Mr.Somsak Jaitrong	Corporate Asia regional director	Southeast Asian Director	Top management	22-Mar-05	2 hrs
J1.2	Mr. Sirichai	JJ Thailand plant	Operations Director	Top management	7-Mar-05	1.5 hrs
J1.3	Mrs. Jira Maneegajana	JJ Thailand plant	R&D and QTA Director	Top management	18-Mar-05	1.5 hrs
J2.1	Mr. Prapan Nitikhunkasem	JJ Thailand plant	Regional Lean manager	Senior manager	15-Mar-05	1 hr
J2.2	Mr. Fueng-Chadil Chotikaian	JJ Thailand plant	Engineering Manager	Senior manager	15-Mar-05	1 hr
J2.3	Mr. Preecha Powanusorn	JJ Thailand plant	Regional Process excellence manager	Senior manager	7-Mar-05	1.5 hrs
J2.4	Dr. Sarawoot Chittratanawat	JJ Thailand plant	Project manager-OEE improvement	Senior manager	15-Mar-05	1 hr
J2.5	Mrs. Parinar Supathamkit	JJ Thailand plant	Regional CIP manager	Senior manager	19-Apr-05	1 hr
J2.6	Mr. Manus Jongsuebchoke	JJ Thailand plant	Supply management manager	Senior manager	15-Mar-05	1 hr
J2.7	Mr. Kiataroon	JJ Thailand plant	Manufacturing Manager	Senior manager	22-Mar-05	1 hr
J3.1	JJTH staff, PE team	JJ Thailand plant	9 people	QI team	15-Mar-05	-

**Appendix 12: The assessment questionnaire for the testing workshop**

**Evaluation of the decision-aid and  
a selection framework for selecting improvement initiatives**

Criteria for decision-aid model assessment will be judged based on three criteria:

1. Feasibility
2. Usability
3. Utility

**Feasible** refers to whether the decision-aid model is feasible and possible to follow

1. **Availability of information** – Feasibility of the input information (is the information needed available?)
2. **Timing** – Time feasibility
3. **Participant** – People and participant/meeting feasibility (feasibility of getting people to join the process)

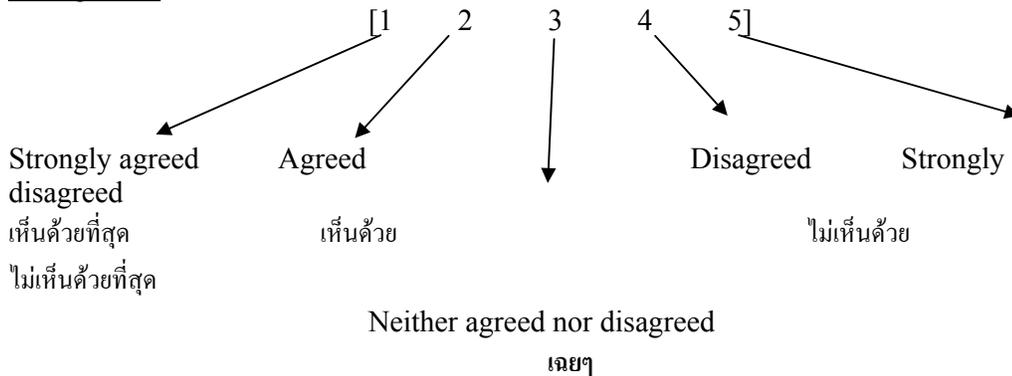
**Usability** refers to how easy and appropriate the decision-aid model is to use

4. **Clarity** – process clarity (process concept, description and explanation are clear)
5. **Ease of use** – the process/step is easy to follow and use
6. **Appropriateness** – the process and technique are appropriate

**Utility** refers to how usefulness the decision-aid model is in reaching the decision and generating output. Is the decision-aid model worth following?

7. **Relevance** – the decision-aid assist the participants to get the output they needed
8. **Usefulness** – Usefulness of the model (is the model useful?)
9. **Facilitation** – the facilitator help the group through the process
10. **Confidence** – confidence in the quality of the output developed from the process

Rating Scale



## แบบสอบถาม Initiative Selection Model Assessment Questionnaire

Evaluation Form

Date วันที่:

กรุณาวางกลมล้อมรอบคำตอบที่ท่านเห็นว่าเหมาะสมในความคิดเห็นของท่านที่สุด

Assessment criteria	(1) เห็นด้วยที่สุด	(2) เห็นด้วย	(3) เฉยๆ	(4) ไม่เห็นด้วย	(5) ไม่เห็นด้วยที่สุด	Suggestions ความคิดเห็น
<b>1. Feasibility</b> ความเป็นไปได้						
1.1 The information required is obtainable by the workshop and group of participants. ข้อมูลที่ต้องการสามารถหาได้จาก workshop และสมาชิกในกลุ่ม	1	2	3	4	5	
The knowledge and experiences of the participants can be used as a source of information. ความรู้และประสบการณ์ของสมาชิกสามารถนำมาใช้เป็นแหล่งข้อมูล	1	2	3	4	5	
There was sufficient time in the workshop to discuss important issues. เวลาใน workshop เพียงพอ ที่จะปรึกษาประเด็นสำคัญ	1	2	3	4	5	
The mix of workshop participants was appropriate. ความหลากหลายของสมาชิกในกลุ่มนั้นเหมาะสม	1	2	3	4	5	
<b>2. Usability</b> ความง่ายและความเหมาะสมในการใช้งาน						
2.1 The objectives of the selection model were clear. เป้าหมายของโมเดลที่ช่วยในการเลือกนั้นชัดเจน	1	2	3	4	5	
2.2 The selection's model and process step was clearly defined โมเดลที่ช่วยในการเลือกและกระบวนการนั้นมีการอธิบายอย่างชัดเจน	1	2	3	4	5	
2.3 Process of the improvement initiative selection was easy to follow and use กระบวนการของการเลือกโปรแกรมการปรับปรุงนั้นง่ายต่อการทำตามและใช้	1	2	3	4	5	

	(1) เห็นด้วยที่สุด	(2) เห็นด้วย	(3) เฉยๆ	(4) ไม่เห็นด้วย	(5) ไม่เห็นด้วย	Suggestions ความคิดเห็น
2.4 The decision-aid model was easy to use by all the participants. ทุกคนในกลุ่มสามารถใช้โมเดลที่ช่วยเหลือในการตัดสินใจได้ง่าย	1	2	3	4	5	
2.5 The decision-aid approach/format for selecting improvement initiative was appropriate. รูปแบบของโมเดลที่ช่วยในการตัดสินใจในการเลือกโปรแกรมนั้นเหมาะสม	1	2	3	4	5	
2.6 Main problems encountered in selection process (Agreed upon the criteria, weighting, rating/ ranking, analysis) ปัญหาหลักๆที่พบในขั้นตอนการเลือก (ขั้นแรกกำหนดเกณฑ์ที่มีการตกลงกัน, การให้น้ำหนัก การให้คะแนน และการจัดลำดับการวิเคราะห์ และ การวางแผนทาง)						
<b>3. Utility ประโยชน์ที่ได้จากการใช้งาน</b>						
3.1 The selection views were relevant to be considered and evaluated among improvement initiatives e.g. Strategic fit, organisation fit, pay-off, fashion. มุมมองในการเลือกนั้นเกี่ยวข้องในการตัดสินใจและประเมินโปรแกรมในการปรับปรุงองค์กร เช่น strategic fit, organisation fit, pay-off, และ fashion	1	2	3	4	5	
3.2 Sub-criteria for initiative's selection were relevant to be considered and evaluated among improvement initiatives e.g. company's performance, marketing performance, organisational culture. เกณฑ์ย่อยในการเลือกนั้นเกี่ยวข้องในการตัดสินใจและประเมินโปรแกรมในการปรับปรุงองค์กร เช่น company's performance, marketing performance, organisational culture	1	2	3	4	5	

	(1) เห็นด้วย	(2) เห็นด้วย	(3) เฉยๆ	(4) ไม่เห็นด้วย	(5) ไม่เห็นด้วย	Suggestions ความคิดเห็น
3.3 The initiative's selection process provides useful steps in selecting the initiative. กระบวนการในการเลือกนั้นมีประโยชน์ในการช่วยเลือกโปรแกรม	1	2	3	4	5	
3.4 The outputs of the process were worth the time put in. ผลลัพธ์ที่ได้มีคุ้มค่างับเวลาที่ใช้ไป	1	2	3	4	5	
3.5 The facilitator helped the group through the selecting process ผู้ดำเนินการช่วยให้กลุ่มเข้าใจเกี่ยวกับกระบวนการทางเลือกมากขึ้น	1	2	3	4	5	
3.6 What degree of confidence do you have in the suggested selecting initiative from the decision-aid model? คุณมีระดับความมั่นใจมากแค่ไหนใน โปรแกรมที่เลือกจากโมเดลที่ช่วยในการตัดสินใจนี้ [0 – 100%] 						
<b>4. Suggestions</b> ข้อเสนอแนะ						
4.1 Strengths of the selection model จุดแข็งของ โมเดลการเลือกนี้						
4.2 Weaknesses of the selection model จุดอ่อนของโมเดลการเลือกนี้						
4.3 Suggestions for improvement ข้อเสนอแนะเพื่อการปรับปรุง						

### Appendix 13: SCG business evolution (1913-2005)

Year	I: Foundation period				II: Growing period
	1913-47	1948-63	1964-71	1972-73	1974-84
<b>Business</b>	1.Siam Cement at Bangsue plant, and Siam fiber cement plant	1.Cement at Bangsue and Tha Luang plant, Siam fiber cement plant, Thailand's first steel&iron plant, CPAC, and Siam refractory	1.Cement at Bangsue and Tha Luang plant, Siam fiber cement plant, CPAC, and Siam refractory 2.Siam iron and steel company	The Siam Cement Group (SCG) was formed and responsible for directing corporate strategy & planning. A white elephant in a hexagon is a corporate logo.	SCG invested in Siam Kraft, Siam Cement Trading (SCT), and the pulp&paper group started with JV
<b>Remarkable events</b>			Being a <b>company under royal patronage since 1964.</b>	First restructured its corporate structure to Siam Cement Group (SCG).	First Thai general manager, Mr.Boonman Wongswan (74-76, 76-80) First thai president, Mr.Charas Xuto (80-84) In 1981, Bangsue plant ceased cement operation
<b>Total Cement Capacity (Tons/year)</b>	108,000	888,000	1,716,000	1,716,000	2,880,000

<----- 60 Years period ----->

<----- 10 Years period ----->

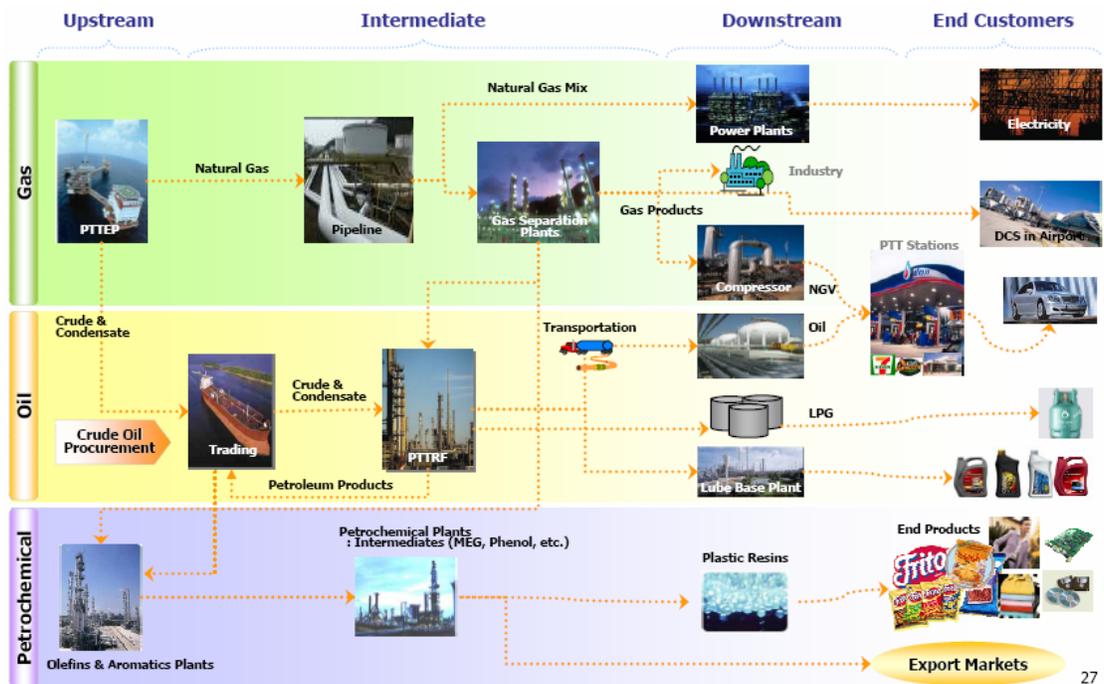
Year	III: Expansion period	IV: Fluctuation period	V: Consolidation and sustainable growth period
	1985-92	1993-2000	2001-2005 (present)
<b>Business</b>	In 1987, SCG started expanding to various business e.g.car engine, TV& home electrical appliance, sanitary ware, plastics Buy Siam tyre from Firestone and being a JV with michelin In 1988, R&D centre was established to monitor the system and quality of JVs Start thai ceramic export and Thai container In 1990, start ceramic floor for US market, SC industrial land company and manufacturing petrochemical product In 1991, start Siam guardian glass, and Siam Unit Cannery company In 1992, SC Khao Wong plant started with today's most advance production technology of 3.6 million tons. SCG made investment in many businesses.	SCG purchased some shares in Thai plastic&chemical company and the largest ceramic floor&wall tile in philippines SCG expanded its foreign investment in 5 industries: Cement, Natural fiber, Ceramic tiles, Pulp and Packaging focused on indochinese countries In 1994, start SC lampang plant with 2.1 million tons/year In 1995, SCG expanded overseas operation especially in Asia through JV. In 1998, After Asian economic crisis since 1997, SCG announced a major restructuring to rebuild itself more flexible and adaptable organisation. New corporate management concentrates on planning and charting a strategic road map for each nine Bus. Focus on core business in Cement, Petrochemical, and pulp&paper	In 2001, SCG rationalised its corporate structure down to six core businesses and two holding companies SCG entered into a joint venture with CP group, TelecomAsia, UCOM, Bangkok Bangk, and Siam Commercial Bank In 2003, ceramics business was merged into building product unit. At present SCG compose of 5 business unit and 2 holding companies.
<b>Remarkable events</b>	The second Thai president, <b>Mr.Paron Israsena Na Ayudhya</b> (85-91) Start receiving award since 1986 e.g.Outstanding Factory for its quality products, U.S. Security council award, and Thai Industrial Standard seal. Second restructured to Cement&refractory, marketing&trading, admin, and 4 Bus (construction material, machinery&electrical product, pulp&paper, others)	The third thai president, <b>Mr.chumpol Na Lamlieng</b> (93-present) In 1993, <b>Total Quality Commitment (TQC)</b> was incorporated to corporate policy In 1993, Third restructured to 4 Bus (Cement, construction material, Machinery&electrical product, Paper&petrochemicals) In 1994, 7 companies certified ISO9002 i.e. Siam Cement, Siam iron&steel, Siam gypsum, SRIC, Thai ceramic, Siam compressor, Thai CRT In 1995, Fourth restructured to Corporate Finance & Admin and 8 Bus (Cement & trading, Construction material, Iron&Steel, Ceramics, Electrical & metal product, machinery, Tyre&auto, Petrochemicals, Paper&container) SCG was voted as the most Ethical & Veritable company in Asia In 1998, SCG received the best practice in corporate governance	In 2001,SCG was voted as one of the top ten companies in Thailand by Far Eastern Economic Review In 2003, the group received numerous recognitions as the leader in this industry from both national and international organisations e.g. Reuters, FinanceAsia and the Stock Exchange of Thailand. SCG has shifted their business model from production based cost advantage model that increase value and business differentiation by installing new machinery and equipment technology to the new model that construct its own knowledge base organisation through innovation.
<b>Total Cement Capacity (Tons/year)</b>	12.4 million	14.5 million	14.5 million

<----- 7 Years period ----->

<----- 7 Years period ----->

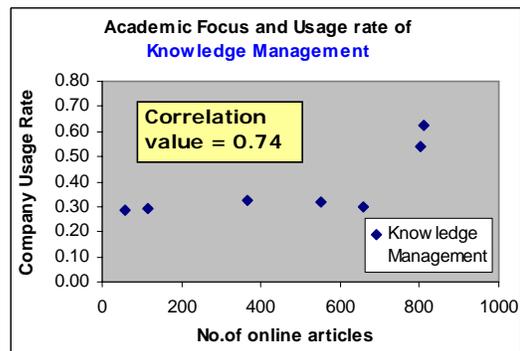
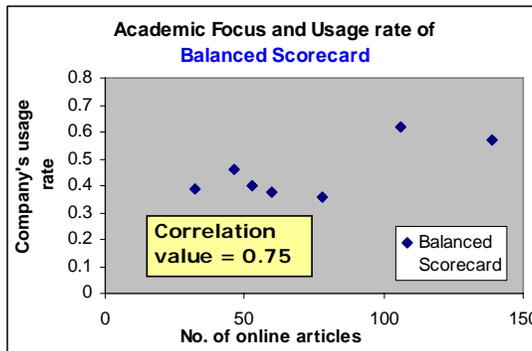
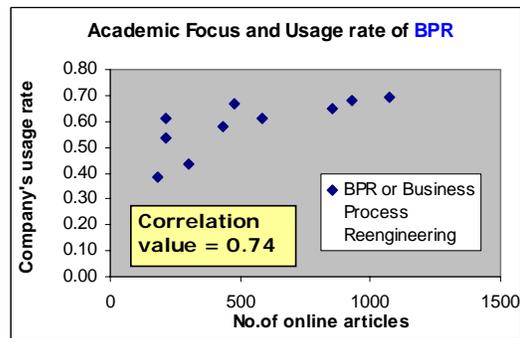
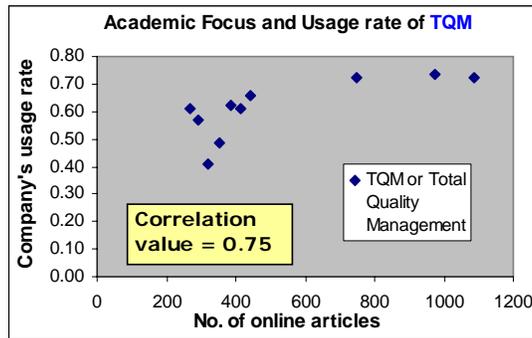
<----- 4 Years period ----->

Appendix 14: PTT fully value chain (PTT 2006)



## Appendix 15: Data for trends analysis

(1 January - 31 December) Year	(1)			(2)			(3)			(4)			(5)			(6)		
	TQM or Total Quality Management			BPR or Business Process Reengineering			Six Sigma			Benchmarking			Knowledge Management			Balanced Scorecard		
	Academic	Company		Academic	Company		Academic	Company		Academic	Company		Academic	Company		Academic	Company	
No. of online articles	Usage Rate	Satisfaction	No. of online articles	Usage Rate	Satisfaction	No. of online articles	Usage Rate	Satisfaction	No. of online articles	Usage Rate	Satisfaction	No. of online articles	Usage Rate	Satisfaction	No. of online articles	Usage Rate	Satisfaction	
1993	1086	0.72	3.78	474	0.67	3.81	10			370	0.70	3.7	5		2			
1994	976	0.74	3.71	930	0.68	3.76	9			315	0.77	3.76	6		8			
1995	748	0.73	3.69	1074	0.69	3.61	3			382	0.76	3.8	12		4			
1996	440	0.66	3.73	854	0.65	3.71	8			305	0.79	3.93	59	0.28	3.48	32	0.39	3.81
1997	386	0.62	3.78	583	0.61	3.72	5			370	0.82	3.88	116	0.30	3.58	46	0.46	3.94
1998	416	0.61	3.94	430	0.58	3.81	34			360	0.82	3.99	365	0.33	3.63	60	0.38	3.89
1999	351	0.49	3.95	302	0.44	3.75	46			297	0.77	3.89	659	0.30	3.43	53	0.40	3.84
2000	319	0.41	3.89	181	0.38	3.85	90			282	0.69	3.89	553	0.32	3.61	78	0.36	3.94
2001	297			158			115			293			707			93		
2002	294	0.57	3.80	211	0.54	3.75	180			328	0.84	3.96	809	0.62	3.63	106	0.62	3.88
2003	259			272			281			340			769			137		
2004	267	0.61	3.93	214	0.61	3.90	290	0.34	3.89	358	0.73	3.98	804	0.54	3.73	139	0.57	3.86
Jan-Aug 2005	117			155			155			218			491			80		
Maximum	1086	0.74	3.95	1074	0.69	3.90	290	0.34	3.89	382	0.84	3.99	809	0.62	3.73	139	0.62	3.94
Correlation value	0.75			0.74			n/a			0.12			0.74			0.75		



## Appendix 16: The database of pay-off evidence

Pay-Off		Improvement Approaches					Authors	Year	Book/Journal/ Publication	Research Method	Suggestions Description	Category of paper				
Category	Sub-category	T	I	L	S	B							E			
Shareholders	Increase stockmarket price	1					1	NIST	2004	The tenth NIST Stock Investment Study	Empirical	Baldrige stock studies showed that the baldrige winning companies had outperformed the benchmark of S&P500 for consecutive nine years since 1993; however, in the last two years it has underperformed.	P			
									George	2002	Quality Progress	Empirical	The Q-100 index of companies that use TQM assembled by Robinson Capital Management is used to compare the stock price with S&P500. The Q-100 outperformed the S&P500 from sep 1998 to dec 2001 determined by the growth in dollars investment. Investors belief	JWO		
									Hendrick & Singhal	2001	Management Science	Empirical	The 608 quality award winners show significantly improve in their stock price performance during the TQM postimplementation period.	J		
									Easton & Jarrell	1998	Journal of Business	Empirical	108 US Firms who implemented TQM during 1981-1991 improved their financial performance and stock returns. Improvement showed stronger in more advanced TQM firms.	J		
									Hendrick & Singhal	1997	Management Science	Empirical	Empirical evidence from Baldrige winner firms. Under the definition that a Quality Award is criterion for a successful implementation of TQM. TQM helps improve stock market price, financial performance, quality and operating performance. The improvements show during the postimplementation period. (5 yrs preimplementation and 5 yrs postimplementation)	J		
				1						Nicolau & Sellers	2002	European Journal of Operational Research	Empirical	Firms in Spain that obtained ISO9000 show positive reaction to Spanish stock market between 1993 and 1999.	J	
										Goh, et al.	2003	Total Quality Management & Business Excellence	Empirical	Unlike TQM, Six Sigma activities did not show an outstanding performance on a macro scale of stock prices by the analysis of the 20 announcements of the six sigma companies. Two analysis include 1) reaction to the stock market to announcement of a six sigma programme on the announcement day which didn't show significant abnormal returns and 2) the long-term stock performance of six sigma companies also didn't show significant abnormal when compared company share prices to S&P 500.	JWO	
Company performance	financial performance	Increase in sales	1					1	Hansson & Eriksson	2002	Measuring Business Excellence	Empirical	The Quality Award recipient perform better in the post implementation period especially in Return on Assets than their competitors. Five performance indicators are 1) changes in sales, 2) return on assets, 3) return on sales, 4) change in total assets, and 5) changes in number of employees.	JWO		
										Rizzo	2004	Quality	Empirical	Year 2003 Survey of 165 CMTC by NIST identified that lean help increase annual sales to \$100 million, and a total annualised cost savings of \$16 million.	JWO	
		Return on assets	1						1	Hansson & Eriksson	2002	Measuring Business Excellence	Empirical	Ibid	JWO	
										Zhang	2000	Total Quality Management	Empirical	Ten manufacturing companies in the Netherland indicated that TQM contributed to improving profitability, process capability, supplier relationship, and employee and departmental communication; reduce defect rate, increase customer's satisfaction and employee	J	
									Laszlo	1996	The TQM Magazine	Description	National Quality Award criteria have a purpose for self-evaluation and aims to recognize successful TQM. A comparison of the national awards of Japan, the USA, Canada, and Europe show similarity in purpose-economic viability and the ability to compete.	J		
									1	Corbett et al.	2005	Management Science	Empirical	By analysing financial performances from 1987-1997 of all publicly traded ISO9000 certified manufacturing firms in the US, it indicated that firms who seek their first ISO9000 certification was followed by significant abnormal improvements in financial performance	J	
										Yasin, et al.	2004	The TQM Magazine	Empirical	Survey of 68 ISO certified portuguese firms indicated that organisation who direct their quality improvement efforts toward improving customer service and satisfaction show higher financial performance (net profit after tax). Madu (1995) also reported a similar finding based on a study of firms in the US and Taiwan.	J	
										Simmons & White	1999	Journal of Managerial Issues	Empirical	The electronics industry in the US who registered for ISO9000 standard in 1995 show more profitable than non-ISO firms.	J	
				0						Dimara et al.	2004	International Journal of Quality & Reliability	Empirical	Firms in Greece who adopted ISO show no significant difference in their financial performance during six year period of adoption. However, when classified them into three categories of strategic orientation (cost, market, and focus strategy).	J	
										Wayhan et al.	2002	Total Quality Management	Empirical	From statistical analysis of 48 certified ISO9000 companies in North America, analysis indicated that ISO9000 certification does not impact financial growth (measured by revenue, stockholder equity, gross profit and ROA)	J	
										Lima, et al.	2000	International Journal of Production Economics	Empirical	Data analysis of the Brazilian firms with ISO9001, ISO9002 and none showed no significant difference in financial performance.	J	
										Thailand Productivity Institute	1999	Benefit/ Cost Ratio in ISO9000 implementation	Empirical	444 companies in Thailand perceived internal benefits from implementing ISO9000 than the external ones. Survey results show that benefits from ISO9000 implementation are the improvements of 1) Internal management, 2) Customer perspective but didn't clearly show the benefits in 3) Financial and 4) Innovation.	P	
										Terziowski, et al.	1997	Journal of Operations Management	Empirical	Questionnaire survey by Australian Manufacturing Council-AMC (1994) of 962 Australian sites and 379 New Zealand sites showed that ISO9000 certification doesn't have a significantly positive effect on organisational performance either in presence or absence of a TQM environment	J	
										1	Motwani, et al.	2004	The TQM Magazine	Empirical	Dow Chemical's six sigma implementation is generating significant financial results through combined impact of revenue growth, cost reductions, and asset utilization.	J
										Best Practice	2000	Building six sigma excellence	Empirical	Case study of GE shows that successful six sigma execution directly increase operating profit margins, reduced cycle time, increase employee productivity, improve customer satisfaction, and minimized production defects.	P	
										0	Guimaraes & Bond	1996	International Journal of Operations & Production Management	Empirical	Survey of 135 manufacturers in US shows that BPR has less impact on company performance and it often creates the pressure imposed in company personnel-employee layoff issue.	J
			Return on sales	1						1	Hansson & Eriksson	2002	Measuring Business Excellence	Empirical	Ibid	JWO
			Changes in total assets	1						1	Hansson & Eriksson	2002	Measuring Business Excellence	Empirical	Ibid	JWO
			Revenue/ turnover growth	1						1	Hansson & Eriksson	2002	Measuring Business Excellence	Empirical	Ibid	JWO
											Eskildson	1995	National Productivity Review	Description	By comparing TQM programs among 150 successful organisation, it described that TQM have limited impact and not a cure-all. Implementing TQM requires considerable effort and time. Using TQM with a purpose to improve financial outcome, quality through error prevention and improving employee morale. However, cost reduction were achieved through non TQM approach not through the TQM philosophy of reducing the cost of poor quality. Revenue improvement were more likely to involve TQM through quality and customer satisfaction.	P
									1	Motwani et al.	2004	The TQM Magazine	Empirical	Ibids.	J	
									0	Altinkemer et al.	1998	International journal of information management	Description	Content analysis of 35 US companies' annual reports show that the primary reasons companies go through process change are cost reduction and customer satisfaction. For BPR the revenue growth is not being considered an objective of BPR efforts.	J	

Pay-Off			Improvement Approaches					Authors	Year	Book/Journal/Publication	Research Method	Suggestions Description	Category of paper		
Category	Sub-category	Cost reduction (Quick results)	T	I	L	S	B							E	
Company performance	financial performance	Cost reduction (Quick results)	1						Blackburn & Benson	1993	The Academy of Management Executive	Description	Evidence from the Baldrige winners (Wallace company, Glbs Metallurgical, IBM Rochester, and Cadillac). Bottom-line payoffs for successful integration of HRM practices and TQM goals show up in reduced costs, increased product reliability, greater customer satisfaction, and shorter product development cycles.	J	Inter mediate
									Rizzo	2004	Quality	Description	Experiences of California Manufacturing Technology Consulting (CMT) are that after lean manufacturing techniques are fully learned, implemented, and maintained, businesses commonly experience reduction in production cost, overhead, factory floor usage, WIP inventory levels.	JWO	
									Cynthia	2003	Harvard Business Review	Description	Lean implementation in JPF helps reducing more than half of average processing time, and hence reduce labour cost by 26%.	J	High
									Jackson & Jones	1996	Implement a lean management system	Description	A lean production system can reduce overall costs especially indirect costs while maintaining quality standard and reducing manufacturing cycle time.	B	
									Ryan	2005	American Society for Quality	Description	Companies adopted six sigma demonstrated huge cost savings and productivity gain such as GE, AlliedSignal and Honeywell, Ford Motor company, Samsung Electronics company, Quadrant Engineering Plastics Products, Bank of America, and Southside Hospital in Bay	P	
									Motwani et al.	2004	The TQM Magazine	Empirical	A case study of Down Chemical company showed \$1.5 billion savings during 2000-2002 from six sigma program. Many industries have used six sigma programs to cut costs (GE, Raytheon Corporation), improve cycle time, reduce defects and increase customer satisfaction (GE, Allied Signal, Raytheon Corporation), and produce a foundation for continuous improvement (Allied Signal, Raytheon Corporation).	J	Inter mediate
									Wade	2004	American Banker	Description	Bank of America has started six sigma program since 2001. Six sigma generated savings and revenue growth to more than \$2 billion during the last three years. The 16 best six sigma projects in 2003 have increased revenue around \$67 million and cut cost to \$18 million.	JWO	
									Monnot	2004	Quality Progress	Description	Wausau Window and Wall systems saved millions of dollars by using simple sixsigma tools combined with lean by reducing inventory, material cost, setup time and by improving cycle	JWO	
									NIST	2002	NIST Baldrige National Quality Program. CEO Issue Sheet	Description	Six Sigma drives process improvement and cost savings	P	
									Han & Lee	2002	Annual Reviews in Control	Description	Goal of Six sigma is to minimise Cost of Poor Quality by using Critical To Quality variables	JWO	
									McClusky	2000	Quality Focus	Description	Six sigma help cost savings (GE achieved \$2 billion savings in 1999, Motorola reduced \$15 billion over 11 years since 1999, Seagate Technology achieve \$132 million in 2 years)	JWO	
									Pande et al.	2000	The Six Sigma Way	Description	Six sigma links its solution to the business and personal bottom line while TQM lack of this integration.	B	
									Snee	1999	Quality Progress	Description	Six sigma is a business improvement approach that seeks to eliminate defects by focusing on critical importance to customers. Hence, customer satisfaction is improved, bottom line show savings and increased revenue.	JWO	
									Maul et al.	2003	International Journal of Operations & Production Management	Empirical	Factor analysis from 33 case companies in UK reveals three characteristics of BPR implementation, which are 1) Strategy focus-improve customer service and competency development, 2) Process focus-change organisational design, and 3) Cost reduction-focusing on immediate market need.	J	Inter mediate
										quality performance	Reduce product/service nonconformities	1			
Williams et al.	2004	International Journal of Quality & Reliability Management	Description	TQM will remain an important issue for top management because of its strength in process and product quality improvement. Moreover, due to the global supply chain trends, trust between partners is important and companies which take TQM seriously would share the common values and results in their behaviour would be more predictable.	J	Inter mediate									
Best Practice	2000	Building six sigma excellence	Empirical	Ibids.	P										
Zhang	2000	Total Quality Management	Empirical	From interview with Ten TQM manufacturers in the Netherlands show improvement in product quality. TQM has much better effects on overall business performance (strategic business performance, process quality, supplier quality management, customer focus, and human resource management) than ISO9000.	J	Inter mediate									
Sierman et al.	1997	Management Science	Empirical	The case of Analog Devices, Inc (integrated circuits manufacturer). In the long run, TQM can increase productivity, raise quality, and lower costs but in the short run, it can create excess capacity, financial stress and pressure for layoffs.	J	High									
Hong & Phitayawejwatt	2005	Journal of Industrial Technology	Empirical	Questionnaire survey of 245 companies (237 manufacturing and 8 services industries) in Thailand indicated that ISO9000-registered organisations show significant improvements in most quality management practices (adopted Rao et al. 8 factors) but no significant.	JWO										
NIST	2002	NIST Baldrige National Quality Program. CEO Issue Sheet	Description	ISO9000:2000 concentrates on fixing quality system defects and product/ service nonconformities.	P										
Quazi et al.	2002	Total Quality Management	Empirical	Questionnaire Survey of 93 firms in Singapore showed that ISO900 registered companies does not affect quality management practices (according to Rao et al. 8 factors) and quality results of firms.	J	Inter mediate									
Withers & Ebrahimpour	2001	Integrated Manufacturing Systems	Empirical	A case study of 11 ISO9000 certified firms in Europe indicated that the most positive impact of ISO9000 was on product quality and others are internal communications, public image and competitiveness.	J	Low									
Thailand Productivity Institute	1999	Benefit/ Cost Ratio in ISO9000 implementation	Empirical	Survey shows that ISO9000 helps internal benefits of enhance product quality and reduce cost of defects and repetitive works.	P										
Skrabec Jr. et al.	1997	Industrial Management	Empirical	Questionnaire survey of 300 companies indicated top five actual benefits from ISO9000 according to degree of agreement are improvement in 1) Documentation, 2) Quality awareness, 3) standard, 4) product quality, 5) clear employees' role and responsibility	J	Inter mediate									
Rao et al.	1997	Total Quality Management	Empirical	Questionnaire Survey of 649 firms in the US, India, China, Mexico showed that ISO900 registered companies show positive impact on 8 factors of quality management practices compared to the companies without ISO or planning to have.	J	Inter mediate									
Ryan	2005	American Society for Quality	Description	Companies adopted six sigma demonstrated huge cost savings and productivity gain such as GE, AlliedSignal and Honeywell, Ford Motor company, Samsung Electronics company, Quadrant Engineering Plastics Products, Bank of America, and Southside Hospital in Bay Shore, NY. Cost savings came from waste and defect reduction, inventory reduction, process improvement and cycle time reduction.	P										
Motwani et al.	2004	The TQM Magazine	Empirical	Ibids.	J	Inter mediate									
Bossert	2003	Quality Progress	Description	Six sigma goal is defect reduction, improvements in profits, employee morale and product	JWO										
Antony & Baneulas	2002	Measuring Business Excellence	Empirical	Aim of six sigma program is to continuously reducing defect. The most important success factor is management commitment.	JWO										
McClusky	2000	Quality Focus	Description	The immediate goal of six sigma is defect reduction which then cause yield improvement and improve customer satisfaction. The ultimate goal is enhanced net income. GE, AlliedSignal, Honeywell, Bossidy are successful six sigma companies.	JWO										
	Shorter lead time/delivery time		1						Drickhamer	2002, 2004	Industry Week	Description	A large number of North America's best manufacturers (2001) have adopted lean manufacturing and IT systems, which resulted in shorter lead times, higher on-time delivery rate, higher inventory turns and better quality. Lean adopted the Toyota Production System philosophy and beyond to emphasis on cost, quality, delivery (time), and profit.	JWO	
									Bossert	2003	Quality Progress	Description	In manufacturing, lean principles include zero waiting time, pull scheduling, smaller batch sizes, and shorter process time.	JWO	
									Jackson & Jones	1996	Implement a lean management system	Description	Lean management system promises the benefits of dramatically reduced lead time, higher labor efficiency and quality, market flexibility, longer machine life, lower inventories and reduce overhead.	B	

Pay-Off			Improvement Approaches					Authors	Year	Book/Journal/Publication	Research Method	Suggestions Description	Category of paper									
Category	Sub-category		T	I	L	S	B							E								
Company performance	operating performance	Improve Cycle time	1						Ryan	2005	American Society for Quality	Description	Cases from the baldrige winners frequently mentioned the bottom line benefits of QM include cost savings and increased operating efficiency. 2002 Baldrige winner Motorola commercial, government and industrial solutions sector showed that application of Business Excellence resulted in cycle time improvement.	P								
									West	2002	DBA thesis	Empirical	Case study at 10 American Semiconductor has found that six sigma methodologies has the highest impact on improving cycle time at individual manufacturing process steps.	B								
		Increase Productivity	1	Sterman et al.	1997						Management Science	Empirical	Ibid	J	High							
				Idris et al.	1996						The TQM Magazine	Empirical	Survey of 247 Malaysian companies shows the main benefits of TQM are 1) Customer Satisfaction, 2) Teamwork, 3) Productivity, 4) Communication, and 5) Efficiency	J	Intermediary							
				Drickhamer	2002, 2004							Industry Week	Description	Ibids	JWO							
				Bossert Oliver	2003							Quality Progress	Description	Lean concept helps Toyota improve productivity, profitability and competitiveness.	JWO							
				Oliver	2002							Working paper (ESRC Centre for Business Research)	Empirical	A combination of traditional Kaizen and Lean production over the period from 1994 to 2001, Japanese automotive plants showed remarkable productivity improvement and defect rates reduction, compared with those in the United States and the United Kingdom	P							
	Ryan	2005							American Society for Quality	Description	Ibid.	P										
	Monnot	2004							Quality Progress	Description	Wausau Window and Wall systems increase their productivity by 28% after implementing six sigma and lean tools.	JWO										
	Marketing performance	Increase market share/ Improve marketing effectiveness/ strengthen brand recognition	1							Utsahawant chakit & Tansuhaj	2003						Empirical	Four Thai and U.S. companies, which have implemented ISO9001 claimed that ISO9001 helps them meet their customer's needs, requirements, expectations and helps export to more international markets. In sum, Marketing effectiveness is a key priority for the adoption.	P			
										McNiel & Greatbanks	2002							Engineering Quality Forum	Empirical	From a survey in UK organisations, ISO9000 has become a business requirement for marketing rather than quality reasons.	P	
										Van der Wiele et al.	2001							Business Process Management Journal	Description	Survey of 160 ISO9000 certified companies in Western Australia by Brown & Van der Wiele (1996) shows that maintain and increase market share is the most important reasons for	J	Intermediary
										Anderson et al.	1999							Production and Operations Management	Empirical	Firms that sell in Europe and other international markets are more likely to seek ISO9000 certification but no evidence of regulatory requirements being imposed on US government suppliers.	J	Intermediary
										Thailand Productivity Institute	1999							Benefit/ Cost Ratio in ISO9000 implementation	Empirical	444 Thai companies agree that ISO9000 is a beneficial marketing tools and it helps access to domestic and international markets.	P	
Kubiak										2003							Quality Progress	Description	ISO represents the fundamental concepts and framework for an effective and basic Quality Management System.	JWO		
Cook										2003							The Canadian manager	Description	ISO9000 is an internationally recognised standard that defines the minimum requirements for organisation, business and quality management system. It enhance customer's satisfaction and consistently meet customer expectation.	JWO		
Internationally recognized standard for organisational QMS	1								Magd & Curry	2003						Description (Literature Review)	There are two main reasons for seeking ISO9000 certification: 1) External motivational factors e.g. customer pressures, market related factors. ISO is a credible and internally recognised QMS. The certification is used for marketing purposes- 'Corporate Image,' and remove trade barriers as supported by the studies in Spain, Australia, New Zealand, Greece, Sweden, Taiwan, the USA, Ireland 2) Internal improvement. Achieve process improvement. Improve quality, efficiency and communication in the organisation	J	Intermediary			
									Anderson et al.	1999							Production and Operations Management	Empirical	From statistical analysis of 514 publicly held manufactures that obtained ISO9000 certificates in North America and a control sample of 1,965 uncertified firms, the results indicated that managers are obtaining ISO9000 as a credible public signal of effective quality management practices and ISO9000 complements rather than substitute TQM. Complying with customer and regulatory requirements appears to be a secondary consideration.	J	Intermediary	
									Laszlo	1996							The TQM Magazine	Description	National Quality Award criteria have a purpose for self-evaluation and aims to recognize successful TQM.	J	Intermediary	

Pay-Off		Improvement Approaches					Authors	Year	Book/Journal/ Publication	Research Method	Suggestions Description	Category of paper			
Category	Sub-category	T	I	L	S	B							E		
Customer satisfaction	customer satisfaction	1						Kiefsjo et al.	2001	Measuring Business Excellence	Description	TQM is a management system consisting of values, methodologies, tools aims to improve customer's satisfaction and reduce amount of resources	JWO		
								Madu et al.	1996	International Journal of Production Research	Empirical	Surveys results from 165 managers on their perception of TQM on organisational performance indicated statistically significant of their strong believe in improvements in customer satisfaction, employee satisfaction, employee service quality and organizational performance. Manufacturing firms tend to perceive more positive relationships between TQM and organizational performance than service firms.	J	High	
								Hodgetts et al.	1994	Organizational Dynamics	Description	Ten core values of a total quality enterprise are: 1) Customer-driven, 2) Leadership, 3) Full participation, 4) Reward system, 5) Reduced cycle time, 6) Prevention, 7) Management by fact, 8) Long-range outlook, 9) partnership development, 10) public responsibility	J	High	
								Noriaki	1993	California Management Review	Description	Four criteria/ concepts for implementing TQM are 1) Customer Satisfaction, 2) Process-oriented production, PDCA cycle, Doing it right the first time, 3) Based decision on data, 4) Employees' commitment.	J	Inter medi ate	
								DTI	2004	Quality Management System	Description	ISO9000 emphasis on process improvement and enhancing customer satisfaction.	P		
								Douglas et al.	2003	The TQM Magazine	Empirical	Survey results of 104 UK organisations revealed that the highest ranked reasons for implementing ISO9000 were 1) to enable organisations to tender for business by satisfying the demands of external customers and potential customers, 2) Improve customer satisfaction	J	Inter medi ate	
								NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Baldrige Criteria for Performance Excellence, ISO9000:2000, Six Sigma each offer different emphasis in helping organisation improve performance and increase customer satisfaction. Baldrige winner 1999 (ST Microelectronics, Inc. Region Americas)	P		
								Thailand Productivity Institute	1999	Benefit/ Cost Ratio in ISO9000 implementation	Empirical	ISO9000 helps external benefits in enhancing customer's satisfaction and develop good relationships with customers. Moreover, reduce inspections from customers.	P		
								NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Ibid.	P		
								McClusky	2000	Quality Focus	Description	Ibid.	JWO		
								Pande et al.	2000	The Six Sigma Way	Description	Benefits of Six sigma are 1) Generates sustained success, 2) sets a performance goal for everyone, 3) Enhances value to customers, 4) Accelerates the rate of improvement, 5) Promotes learning organisation, 6) Executes strategic change	B		
								Best Practice	2000	Building six sigma excellence	Empirical	Ibid.	P		
								Bhatt	2000	Business Process Management Journal	Empirical	Survey with 73 firms from Fortune 500 US firms showed that network infrastructure in BPR is critical to improve business process and enhance customer services.	J	Inter medi ate	
								Al-Mashari & Zairi	2000	Business Process Management Journal	Description	BPR focuses towards improving quality, customer, and innovation (Process improvement thrust and customer focus) rather than emphasising control and cost cutting.	J	Inter medi ate	
								Boje et al.	1997	Communication Research	Description	Deconstruct reengineering of Hammer & Champy 1993, principle of BPR are 1) Discontinuous thinking, 2) Dramatic change in organization, 3) Radical redesign-invention, 4) Process-oriented thinking focused on delivering value to customer, and 5) Use IT as enabler to radical	J	Inter medi ate	
								Guimaraes & Bond	1996	International Journal of Operations & Production Management	Empirical	Ibid.	J	Inter medi ate	
								Hammer	1995	The Reengineering Revolution	Description	The driving forces for BPR are Customers, Competition, and Change.	B		
								Zairi & Sinclair	1995	Management Decision	Empirical	Ibid.	J	Inter medi ate	
								NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Ibid.	P		
								Pritchard & Armistead	1999	Business Process Management Journal	Empirical	Survey among European organisations shows that three main benefits from BPM are 1) improve customer's relationship, 2) better cross-functional working, and 3) change in organisational change.	J	Inter medi ate	
Human resources	Reduce numbers of employees	1						Kiefsjo et al.	2001	Measuring Business Excellence	Description	Ibids	JWO		
								Boje et al.	1997	Communication Research	Description	Reengineering was used mostly to justify downsizing by laying off employees. Bureaucracy is an oppositional term to reengineering. Bureaucratic organisations character as tall hierarchical structures, and centralized which are opposed to flat and decentralized reengineering organisations. Reengineering decentralization leads to empowerment and establishes tighter control through IT and computerized monitoring.	J	Inter medi ate	
								Guimaraes & Bond	1996	International Journal of Operations & Production Management	Empirical	Survey of 135 manufacturers in US shows that BPR has less impact on company performance and it often creates the pressure imposed in company personnel-employee layoff issue.	J	Inter medi ate	
	Reduce amount of resource usage	1							Hensler & Kiefsjo	2004	Measuring Business Excellence	Description	Ibids	JWO	
									Kiefsjo et al.	2001	Measuring Business Excellence	Description	Ibids	JWO	
									Hunter	2004	Upholstery Design & Management	Description	Goal of lean manufacturing is to optimise people and materials. Four fundamental attribute of lean are: 1) Lowest unit cost, 2) 100% good quality, 3) shortest throughput and 4) Flexibility	JWO	
	Womack et al.	1990	The machine that changed the world, Rawson Associates	Empirical/ Description	Lean principle by Womack, Jones and Roos aims to make better product, increase productivity and accurately meet customer's demand by using less space, capital, and labour.	B									
	Increase dexterity or flexibility of workman					1			Boje et al.	1997	Communication Research	Description	In reengineering, all work processes are simplified, delinearized (jobs are done simultaneously) and invention of machines-IT, which then enhance flexibility of the worker and hence increases the quantity of work.	J	Inter medi ate
	Provide rewards and recognition (Certification, Credential)	1							Hodgetts et al.	1994	Organizational Dynamics	Description	One of the ten core values of a total quality enterprise is a Reward system	J	
									Tippett & Waits	1994	Industrial Management	Description	Successful TQM, upper management must incorporate a feedback and reward system together with the traditional measures of project successes which are schedule, cost, and technical performance.	J	Inter medi ate
									Magd & Curry	2003	The TQM Magazine	Description	ISO9000 certification allows organisations to be recognised for the company's quality by their 3rd party	J	Inter medi ate
									Thailand Productivity Institute	1999	Benefit/ Cost Ratio in ISO9000 implementation	Empirical	Survey results show that ISO9000 gives most benefits to the company and secondly to employee who feel proud of working in international standard company. Enhance employee's morale.	P	
Brian									2005	Manufacturing Engineering	Description	The Society of Manufacturing Engineering (SME), the Association for Manufacturing Excellence (AME), and the Shingo Prize for Excellence in Manufacturing develop a new industry standard for lean certification.	JWO		
Caulcatt									2001	Journal of Applied Statistics	Description	Process improvement leaders in six sigma are entitled MBB, BB, and GB respectively. They are key drivers for successful implementation. Many of them appear to enjoy high job satisfaction and high status within their company.	JWO		
Mahoney & Thor	1994	American Management Association	Description	Purpose of quality award (Deming Prize, Baldrige) is to promote quality awareness, recognise quality achievements and publicise successful quality strategies.	B										

Pay-Off		Improvement Approaches					Authors	Year	Book/Journal/ Publication	Research Method	Suggestions Description	Category of paper			
Category	Sub-category	T	I	L	S	B							E		
Process Improvem	Process innovation breakthrough					1		Davenport et al.	2003	Computerworld	Description	Consensus definition of reengineering are 1) radical redesign and improvement of work, 2) organisation wide business processes, 3) Use IT as an enabler of new ways of working.	JWO		
								Maul et al.	2003	International Journal of Operations & Production Management	Empirical	Factor analysis from 33 case companies in UK reveals three characteristics of BPR implementation, which are 1) Strategy focus-improve customer service and competency development, 2) Process focus-change organisational design, and 3) Cost reduction-focusing	J Inter medi ate		
								Khan	2000	International Journal of Production Economics	Empirical	A case study of air cargo handling process showed that BPR had successfully redesigned the cargo handling process to achieve dramatic improvement in operational efficiencies for quality service and speed of an airline cargo handling process.	J Inter medi ate		
								Valiris & Glykas	1999	Business Process Management Journal	Description	Existing BPR literature concentrate either on process improvement which is performed in incremental change or process innovation which show a radical change.	J Inter medi ate		
	Reduce process variability, create process stability, stable variation, process predictability and control	1							Magd & Curry	2003	The TQM Magazine	Description	ISO9000 series has formalised systems for evaluating the ability of organisations to consistently design, produce and deliver quality products and services. It help create stability and consistency in the organisation's work.	J Inter medi ate	
									Kubiak	2003	Quality Progress	Description	ISO create process stability, stable variation and process predictability.	JWO	
									Douglas et al.	2003	The TQM Magazine	Empirical	Survey of 104 UK organisation shows that the highest ranked benefits is providing organisational consistency and management control.	J Inter medi ate	
									NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Baldrige winners 1993 (Ames Rubber Corporation, Eastman Chemical company) agreed that ISO lays a foundation for procedural standardization, maintainable systems for process documentation and training and significantly reduce variability.	P	
						1				Revere et al.	2004	The TQM Magazine	Description	Six sigma in healthcare have resulted in cost reduction in surgical inventory, increase efficiency in many processes e.g. bill payment, queuing which lead to higher patient satisfaction. It may hold key in reducing patient-related errors and rise in patient safety.	J Inter medi ate
										Bossert & Grayson	2002	ASQ Six Sigma Forum Magazine	Description	Interview with James Bossert, Kevin Grayson, Jane Hayward, Randy Kesterson, Sam Windsor concluded that both lean and six sigma although different approaches, show similar results of process improvement and financial results. Six sigma, developed by Motorola, attack variation and process consistency (repeatability & reproducibility) and use data to find effective solutions; while lean address visible problems e.g. reduce waste and improve efficiency of a	JWO
										Hammer	2002	MIT Sloan Management Review	Description	Six Sigma with a project-oriented and problem solving nature need to be positioned under a process management which yield in cost reduction but not a vehicle for business	J High
										West	2002	DBA thesis	Empirical	The overall objectives of six sigma approaches to process improvement are 1) to define and measure variation of its causes, 2) to develop operational means to control and reduce the variation, and 3) to obtain more efficient and capable manufacturing process	B
	Provide formalised, systematic and practical improvement methodology	1							Hensler & Klefsjo	2004	Measuring Business Excellence	Description	TQM is a management system consisting of value (core objectives which give strong dedication to customers and form organisation's culture), methodologies (PDCA/PDSA), and tools (diagrams or statistical decision tools).	JWO	
									Noriaki	1993	California Management Review	Description	Ibid	J Inter medi ate	
							1				Motwani et al.	2004	The TQM Magazine	Empirical	Six sigma is a structured methodology for managing change with DMAIC steps.
										Hammer	2002	MIT Sloan Management Review	Description	Six sigma is a project- based methodology. DMAIC offers a structured and disciplined methodology for solving business problems.	J High
										Pande et al.	2000	The six sigma way	Description	Six sigma organisation have a five-phase improvement of Define, Measure, Analyze, Improve, and Control-DMAIC, DMAIC, grounded in PDCA cycle, apply to both process improvement and process design/redesign efforts.	B
									McClusky	2000	Quality Focus	Description	Six sigma is a metric, a method, a set of tools, which is very effective one.	JWO	
									Snee	1999	Quality Progress	Description	Distinctions between six sigma and other quality improvement approaches are 1) Integrating the human and process elements improvement, 2) Focusing on bottom line, and 3) Linking improvement tools into an overall approach	JWO	
									Shin & Jemella	2002	Business Process Management Journal	Empirical	There is a lack of consensus on BPR methods, which has resulted in many unsuccessful BPR projects.	J Inter medi ate	
									Valiris & Glykas	1999	Business Process Management Journal	Description	BPR is lack of systematic approach that can lead a process redesigner to achieve process redesign.	J Inter medi ate	
Provide a set of quality improvement tools		1							Hensler & Klefsjo	2004	Measuring Business Excellence	Description	Ibid	JWO	
										Klefsjo et al.	2001	Measuring Business Excellence	Description	TQM is a management system consisting of values, methodologies and tools that aims to improve customer satisfaction with a reduced amount of resources.	JWO
										Noriaki	1993	California Management Review	Description	The structure of TQM (House of TQM) includes Purpose (Customer satisfaction/ Quality Assurance), Tools (concepts, techniques, vehicles), and Motivation.	J Inter medi ate
									Feld	2001	St.Lucie Press	Description	Lean provide extension to the problem solving tool box	B	
Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	1							NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Ibid	P		
										Zuckerman	2000	World Trade	Description	ISO9000 is a communication tool that is documentation based. It helps better internal communication, managing and monitoring information flow, and able to provide strategic analysis.	JWO
										Anderson et al.	1999	Production and Operations Management	Empirical	ISO9000 are a set of documented, standardized procedures that have as their goal the assurance of product uniformity and conformance to specifications through superior management control practices.	J Inter medi ate
										Skrabec Jr. et al.	1997	Industrial Management	Empirical	Ibid.	J Inter medi ate
										Drickhamer	2002	Industry Week	Description	Lean programs are centred on teamwork base. Basic lean-manufacturing techniques are 5Ss, standardized work, and the elimination of waste.	JWO
Foundation for process documentation, maintainable systems	1							NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Ibid	P		
										McNeil & Greatbanks	2002	Engineering Quality Forum	Empirical	Survey in UK organisations shows that ISO9000 series give quality and documented standard which help process and tighten control.	P
										Thailand Productivity	1999	Benefit/ Cost Ratio in ISO9000	Empirical	444 Thai companies agree that most benefits from ISO9000 is improving documentation system.	P
										Skrabec Jr. et al.	1997	Industrial Management	Empirical	Ibid.	J Inter medi ate

Category	Pay-Off	Sub-category	Improvement Approaches					Authors	Year	Book/Journal/Publication	Research Method	Suggestions Description	Category of paper					
			T	I	L	S	B							E				
Process Improvement	Improve workflow, reduce non value-added activity (NVA), and wastes		1				Rizzo	2004	Quality	Description	California Manufacturing Technology Consulting (CMTCC) reveals that Lean manufacturing technique improve the workflow, reduce unnecessary inventory, material handling, time and	JWO						
							Bicheno	2004	The new lean toolbox	Description	Fast and flexible flow is the vision of lean (both old and new lean concept and in manufacturing and service), and the principles means are waste and variation prevention and reduction.	B						
							Kubiak	2003	Quality Progress	Description	Lean focuses on driving out waste, Non Value Added Activities, and promote work standardization and work flow (from existing process)	JWO						
							Bossert & Grayson	2002	ASQ Six Sigma Forum Magazine	Description	Lean tools are used to reduce waste, and six sigma to reduce variation.	JWO						
							Hutchins	2001	Quality Progress	Description	Bodek, founder and CEO of Productivity Press described that Lean means an organisation is operating at its most efficient and effective level and eliminating virtually all nonvalue-adding activities and waste.	JWO						
							Zayko et al.	1997	Industrial Engineer	Empirical	At Gilman Sciences, Inc., a microporous membrane filtration manufacturer, Lean manufacturing shows improvement in WIP, raw and finished goods inventory reduction, high customer delivery performance, and increase throughput time.	JWO						
							Shin & Jemella	2002	Business Process Management Journal	Empirical	Second phase of BPR at Chase is a focus phase, which is the simultaneous assessment of process, organisation, financial, and IT. One goal is a process improvement, which shows quick results e.g. eliminating bureaucracy, non value added activities (NVA).	J Intermedi						
							Al-Mashari et al.	2001	Business Process Management Journal	Empirical	Ibids.	J Intermedi						
							Nhira	2001	Management Services	Description	Based on literature review, objectives of BPR are to improve workflow, eliminates errors and waste, minimise delays and use of assets, make effective, efficient, and adaptable processes.	J Intermedi						
							Hammer & Goding	2001	Quality	Description	BPR or process redesign is a holistic in nature which lead to a new mode in operation. It involves creative invention, small number of large project and lead to major change.	JWO						
							Bhatt	2000	Business Process Management Journal	Empirical	Ibids.	J Intermedi						
							Shin & Jemella	2002	Business Process Management Journal	Empirical	The case of Chase Manhattan Bank employ BPR to redesign of business process, concurrent examination and redesign of IT and organization that support these processes. Successful reengineering efforts lead to business transformation (new products, services, customer services) which appear in the form of improved information flows.	J Intermedi						
							Nhira	2001	Management Services	Description	BPR focuses less on current work processes and emphasizes re-design by utilising IT.	J Intermedi						
							Enhance inventory management			1			McClusky	2000	Quality Focus	Description	Interview and a tour in GE plant revealed that Six sigma missing a focus on inventory, while JIT or lean does.	JWO
							Zayko et al.	1997	Industrial Engineer	Empirical	Lean help reducing WIP, raw and finished goods inventory reduction	JWO						
Organisation	Improve competitiveness, effectiveness and flexibility of a whole organisation	1				Goetsch & Stanley	2003	Pearson Education	Description	Total quality is an approach to doing business that attempts to maximize the competitiveness of an organization through the continual improvement of the quality of its products, services,	B							
						Zairi & Sinclair	1995	Management Decision	Empirical	A survey shows that TQM as well as BPR aim to improve competitiveness, effectiveness and flexibility of a whole organisation.	J Intermedi							
						Katayama & Bennett	1999	International Journal of Production Economics	Empirical	Agility, adaptability and leanness are not alternatives, but are mutually supporting concepts. They formed 3 pillars to improve competitiveness and the prospect of survival, which are 1) Responsiveness to customer's requirement (Agle), 2) Resource efficiency and high performance (Leanness), and 3) Cost sensitivity at different demand levels (Adaptability)	J Intermedi							
						McClusky	2000	Quality Focus	Description	The Six sigma approach only hits part of the requirements for a systematic whole business improvement method. Baldrige criteria for performance excellence or the European Quality Award although not a prescriptive but they view the whole business.	JWO							
						Hammer	2002	MIT Sloan Management Review	Description	Six sigma should be position under the process-management umbrella. Companies that have been successful with six sigma have learned that it cannot do everything, Bombardier feedback of six sigma limitations are 1) it concentrate on low-level and small scale activities within one functional unit of the organisation, 2) it was not well aligned with the organisation's strategy as a whole and the aggregate projects didn't contribute to larger corporate goals, 3) breakthrough improvement require fundamental change and six sigma's impact was limited.	J High							
						Shin & Jemella	2002	Business Process Management Journal	Empirical	Reengineering is different from other process improvement (Quick hit, and incremental improvement). BPR demonstrates breakthrough changes and organisational change through dramatic process transformation.	J Intermedi							
						Zairi & Sinclair	1995	Management Decision	Empirical	Survey in 65 UK firms reveals that BPR showed the most benefits in 1) Customer satisfaction and increase competitiveness, 2) flexibility/ responsiveness and product/service quality, 3) process focus and delivery performance.	J Intermedi							
						Byrne & Norris	2003	ASQ Six Sigma Forum Magazine	Description	The authors believe that MBNQA is to help build market competitiveness, improve performance excellence, and increase shareholder value.	JWO							
						NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Focus on performance excellence for the entire organisation. Identify and track all-important organizational results: customer, product/service, financial, human resource, and organizational effectiveness.	P							
						McClusky	2000	Quality Focus	Description	Ibid.	JWO							
						Pritchard & Armistead	1999	Business Process Management Journal	Description	TQ or Business Excellence models are approach seeking to improve organisational effectiveness.	J Intermedi							
						Build a foundation for continuous improvement			1			Khoo & Tan	2003	The TQM Magazine	Description	Ibids.	J Inter	
						DTI	2004	Quality Management System	Description	ISO9000 contains eight quality management principles: Customer focus, Leadership, Involving people, process approach, systems approach, continual improvement, factual decision making, and mutually beneficial supplier relationships.	P							
						Magd & Curry	2003	The TQM Magazine	Description	ISO9000 is a basic foundation for TQM	J Intermedi							
						NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Interviewing with 1993 Baldrige winners (Ames Rubber Corporation, Eastman Chemical company) and 1999 winners (STMicroelectronics, Inc.-region Americas, Sunny Fresh foods). Baldrige Criteria for Performance Excellence, ISO9000:2000, Six Sigma build a foundation for Continuous Improvement.	P							
Motwani et al.	2004	The TQM Magazine	Empirical	Ibids.	J Intermedi													
Byrne & Norris	2003	ASQ Six Sigma Forum Magazine	Description	Six sigma's emphasis on statistical analysis and its methodology deliver concrete and measurable results. Combining Baldrige criteria as goals with six sigma method create ongoing organizational transformation.	JWO													
NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Ibids.	P													
Pande et al.	2000	The Six Sigma Way	Description	Six sigma organisation demands a broad scope of activity and commitment, measuring and improving all processes with the objective to build responsive, closed loop system or 'create a culture of continuous renewal'	B													
Khoo & Tan	2003	The TQM Magazine	Description	A comparison of the differences and overlapping concepts between the US and Japanese approach to TQM according to MBNQA, the Deming Prize, and the JQA demonstrated that the overlapping core concepts are in social responsibilities, employee education, strong customer-focus, and continuous improvement.	J Intermedi													
NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Ibids.	P													
Hutton	2000	ASQ Quality Press	Description	Assessment in the Baldrige program is the basis of a complete closed loop cycle for driving continuous improvement and change throughout an organisation.	B													

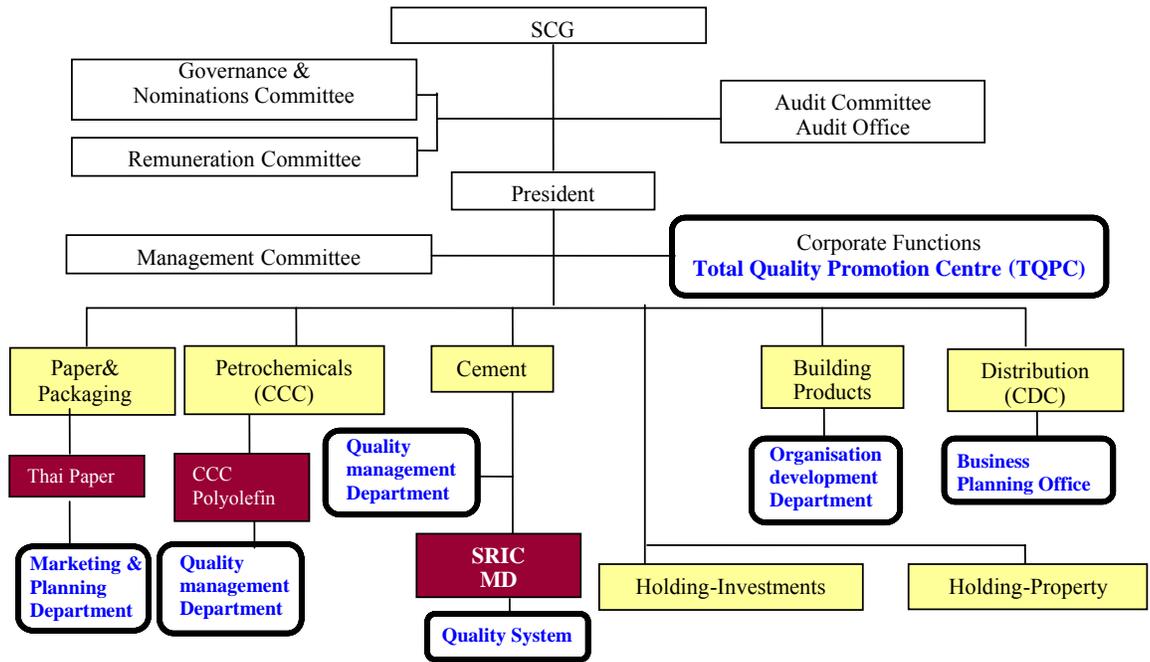
Pay-Off		Improvement Approaches					Authors	Year	Book/Journal/ Publication	Research Method	Suggestions Description	Category of paper		
Category	Sub-category	T	I	L	S	B							E	
Organisation	Create agile and learning organisation			1				Kubiak	2003	Quality Progress	Description	Lean creates agile and learning organisation	J/WO	
								Gunasekaran	2001	Elsevier Science	Description	Being lean is the first step to build an Agile manufacturing.	B	
								Feld	2001	St.Lucie Press	Description	Lean create agile and efficiency organisation	B	
								Jackson & Jones	1996	Implement a lean management system	Description	Four strengths of lean are: 1) Policy bridge to implementation uses an adaptation of hoshin/policy management to link the top management's strategic plan and the daily activities, 2) create an organizational learning by continuously learning and challenging new targets in nine areas of waste, 3) Employee involvement and 4) cross functional management	B	
	Not interrupting operations and not require involvement from the whole organisation			1				Cynthia	2003	Harvard Business Review	Description	Advantage of lean initiative over BPR is that companies can introduce a lean system without significantly disrupting operations. The key is to adopt lean in the most advocate area called 'model cell'. This would allow managers to conduct experiments and working toward an optimal design. Seven dimensions of redesign the cell workflow are: Link and locate processes close to one another (value stream), Standardizing procedures, Eliminate loop-backs or repeated works, Setting a common 'takt time', Balancing loads, Segregating complexity, and Posting performance results.	J	High
								Feld	2001	St.Lucie Press	Description	Lean do not require involvements from the whole organisation.	B	
	Motivate intensive trainings				1			Best Practice	2000	Building six sigma excellence	Empirical	GE invested heavily in six sigma training to achieve quality improvement. In 1997, GE spent almost \$400 million in overall training.	P	
								Pande et al.	2000	The Six sigma way	Description	Six sigma invest both time and money on training. At GE, Blackbelts take 3 weeks of training with follow-up exams, Greenbelt trained at minimum of 2 weeks in six sigma method. TQM trainings are ineffective since they focus on tools but not when and how to.	B	
	Improve organisational culture, R&R		1					Eskildson	1995	National Productivity Review	Description	Typical TQM programs emphasize early development of mission and vision statements and widespread employee education, involvement, and sharing of information with the underlying assumption that culture change will lead to desired results.	P	
								Smith et al.	1994	International Journal of Operations & Production Management	Empirical	Successful TQM programme has a role to create culture change by changing attitudes and behaviour through TQM systems, tools and techniques. Four approaches to TQ implementation: 1) Visionary mindset of TQ, 2) Planning mindset, 3) Learning mindset, and 4)	J	Inter mediate
						1		Motwani et al.	2004	The TQM Magazine	Empirical	Six sigma program create an environment for positive, powerful cultural change e.g. data-driven or fact-based decision.	J	Inter mediate
								Best Practice	2000	Building six sigma excellence	Empirical	GE's success in implementing six sigma is its emphasis on integrating the program with its corporate culture (e.g. high-level training programs)	P	
	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)			1				DTI	2004	Quality Management	Description	QMS will not function or improve without adequate audits and reviews. Audits indicate necessary	P	
								Magd & Curry	2003	The TQM Magazine	Description	ISO9000 offer a model and a process for continuous self-assessment	J	Inter mediate
							1	Kubiak	2003	Quality Progress	Description	The Baldrige award is a set of criteria that address business excellence practices identified by experts in the field. The Baldrige applicant does self-assessment according to the criteria, and is reviewed by examiners, and then receives a comprehensive	JWO	
								NIST	2002	NIST Baldrige National Quality Program: CEO Issue Sheet	Description	Identify and track all important organisational results: Customer, Product/ service, Financial, Human Resource, and Organisational Effectiveness. Ames Rubber Corporation, 1993 Baldrige winner, said 'Baldrige gives an overarching set of criteria questions	P	
								McNeil & Greatbanks	2002	Engineering Quality Forum	Empirical	Survey in UK organisations shows that EFQM focus the whole business and it is used to benchmark and gap identification.	P	
								Pricewaterhouse coopers	2000	Report on the evaluation of the public sector excellence programme	Empirical	Survey results for the use of EFQM excellent model from 496 public sector organisations in UK indicated that they decide to use the excellent model to identify improvement opportunities and for self-assessment purposes and little take up for the purpose of winning an award. 81% of respondents indicated that the model had been a very effective or effective tools.	P	
								Hutton	2000	ASQ Quality Press	Description	Assessment helps establish a more focused set of priorities for improvement, provide self-examination and diagnosis.	B	
	Accelerate and maintain organisational improvement efforts, and energize employees						Laszlo	1996	The TQM Magazine	Description	National Quality Award (Deming prize, MBNQA, Canada award, EQA) criteria have a purpose for self-evaluation and aims to recognize successful TQM.	J	Inter mediate	
					1	Pricewaterhouse coopers	2000	Report on the evaluation of the public sector excellence programme	Empirical	Majority of 496 UK public sector organisations believed that the excellence model helps achieve continuous improvement, improve strategic management thinking, link together key policies and initiatives, and achieve sustained level of performance.	P			
Motivate quality awareness and increase total participations in improving organisation						Hotton	2000	ASQ Quality Press	Description	Assessment cycle will lead to sustainable improvements in the organisation's performance	B			
						Daily & Bishop	2003	Journal of Managerial Issues	Empirical	TQM emphasises customer satisfaction, employee involvement, and continuous quality improvement. Questionnaire results from 169 employees in Canadian automotive manufacturer and US service facility indicated four critical factors in Employee Involvement within TQM are 1) management support, 2) training for skill building, 3) teamwork, 4) rewards.	J	Low		
						McNeil & Greatbanks	2002	Engineering Quality Forum	Empirical	Survey in UK organisations shows that TQM increase quality awareness, and develop a quality culture.	P			
						Tippett & Waits	1994	Industrial Management	Description	TQM principles emphasize the longer-term perspectives of team building, and employee development and motivation.	J	Inter mediate		
						DTI	2004	Quality Management System	Description	One of ISO9000 principles is the involvement of people at all levels in the organisation and ensuring an awareness of meeting customer satisfaction.	P			
						Magd & Curry	2003	The TQM Magazine	Description	Demonstrate the management commitment to quality	J	Inter mediate		
						Van der Wiele et al.	2001	Business Process Management Journal	Description	Based on the survey of Brown & Van der Wiele (1996), the most significant internal benefits of ISO9000 is raising quality awareness.	J	Inter mediate		
						Zuckerman	2000	World Trade	Description	ISO9000 encourages full employee involvement and open communication.	JWO			
						Skrabec Jr. et al.	1997	Industrial Management	Empirical	Ibid.	J	Inter mediate		
					1	Shnee	1999	Quality Progress	Description	Six sigma creates an infrastructures provided by Master Black Belt, Black Belt, and Green Belt.	JWO			
						Goetsch & Stanley	2003	Pearson Education	Description	MBNQA program is intended to 1) Promote awareness of quality improvement, 2) Recognize organizations that have made substantial improvements in products, services, and overall competitive performance, 3) Sharing of best-practices information among U.S. organisations.	B			

**Appendix 17: Credibility scores of pay-off claims for six initiatives**

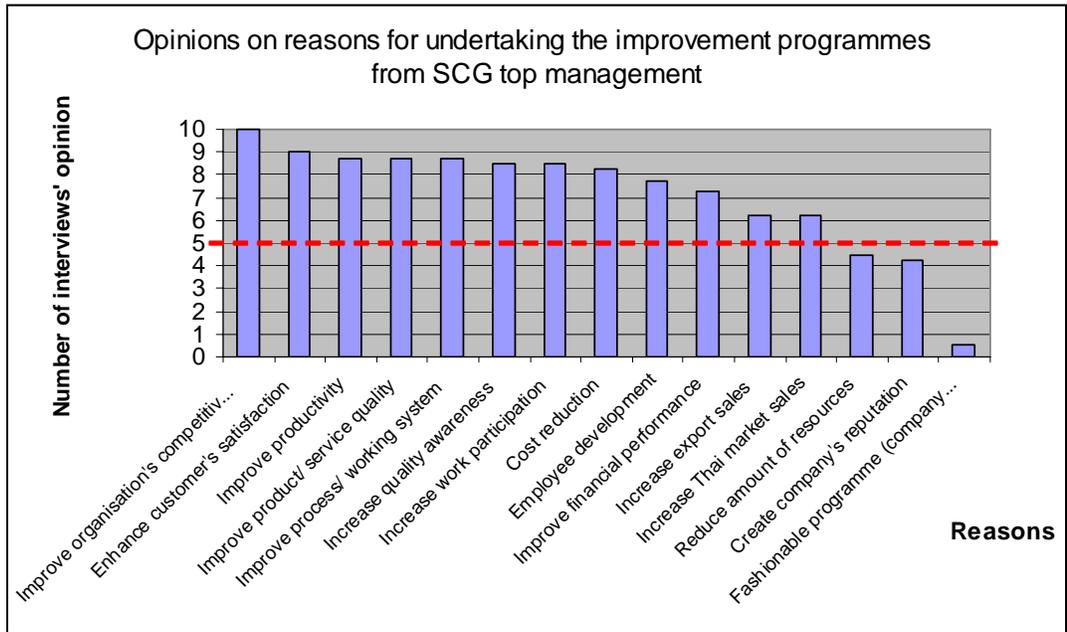
No.	Pay-offs Area	Suggested Benefits Lists	Direction (Positive +, Neutral 0, Negative -)	Initiatives																															
				TQM				ISO				Lean				Six Sigma				BPR				BE											
				S	E	C	T	S	E	C	T	S	E	C	T	S	E	C	T	S	E	C	T	S	E	C	T								
1	Shareholder benefits	Increase stockmarket price	1.1+ + 1.1 0 2.1 0	3	3	3	9	2	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	9				
2	Company performance	Increase Financial performance (profitability, cost reduction)	2.1+ + 2.1 0	3	3	3	9	3	3	3	9	1	1	1	3	2	3	3	8	-	-	-	-	3	1	1	5	-	-	-	-	3	3	3	9
		Quality performance (reduce nonconformity, shorter leadtime)	2.2+ +	3	3	3	9	3	3	2	8	1	0	3	4	2	2	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Operating performance (increase productivity, improve cycle time)	2.3+ +	3	3	3	9	-	-	-	-	1	1	3	5	2	2	3	7	3	2	3	8	-	-	-	-	-	-	-	-	-	-	-	-
		Average	+	3.0	3.0	3.0	9.0	3.0	3.0	2.5	8.5	1.0	0.7	2.3	4.0	2.0	2.3	3.0	7.3	3.0	2.0	3.0	8.0	3.0	3.0	8.0	3.0	3.0	3.0	3.0	9.0				
3	Marketing performance	Increase marketing effectiveness	3.1+ +	-	-	-	-	3	3	3	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		Internationally recognised standard for QMS	3.2+ +	-	-	-	-	3	1	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	1	3				
		Average	+	-	-	-	-	3.0	2.0	3.0	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	0.0	1.0	3.0				
4	Customer satisfaction	Increase customer satisfaction	4.1+ +	3	1	3	7	2	2	3	7	-	-	-	-	1	1	3	5	3	3	3	9	2	1	2	5	-	-	-	-				
5	Human resources	Reduce number of employees	5.1+ +	1	0	1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	5	-	-	-	-	-	-	-	-				
		Reduce amount of resource usage	5.2+ +	1	0	2	3	-	-	-	-	1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		Increase dexterity/ flexibility of employee	5.3+ +	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	1	3	-	-	-	-	-	-	-	-				
		Provide rewards and recognition	5.4+ +	2	0	2	4	2	1	2	5	1	0	1	2	1	0	1	2	-	-	-	-	-	-	-	-	1	0	1	2				
		Average	+	1.3	0.0	1.7	3.0	2.0	3.0	2.0	5.0	1.0	0.5	1.5	3.0	1.0	0.0	1.0	2.0	2.0	0.5	1.5	4.0	1.0	0.0	1.0	2.0	2.0	0.0	1.0	2.0				
6	Process improvement	Process innovation breakthrough	6.1+ +	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3	7	-	-	-	-	-	-	-	-				
		Reduce process variation and create process stability	6.2+ +	-	-	-	-	2	1	3	6	-	-	-	-	3	1	3	7	-	-	-	-	-	-	-	-	-	-	-	-				
		Provide formalised, systematic and practical improvement methodology	6.3+ +	2	0	2	4	-	-	-	-	-	-	-	-	3	1	3	7	-	-	-	-	-	-	-	-	-	-	-	-				
		Provide a set of QI tools	6.4+ +	2	0	3	5	-	-	-	-	1	0	1	2	1	0	3	4	-	-	-	-	-	-	-	-	-	-	-	-				
		Promote procedural and standardisational work	6.5+ +	-	-	-	-	3	2	3	8	1	0	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	2				
		Foundation for process documentation and maintainable system	6.6+ +	-	-	-	-	2	3	3	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		Improve workflow, reduce NVA activity and wastes	6.7+ +	-	-	-	-	-	-	-	-	1	1	3	5	-	-	-	-	3	3	3	9	-	-	-	-	-	-	-	-				
		Create fast, flexible and accessible information	6.8+ +	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	5	-	-	-	-	-	-	-	-				
		Enhance inventory management	6.9+ +	-	-	-	-	-	-	-	-	1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		Average	+	2.0	0.0	2.5	4.5	2.3	2.0	3.0	7.3	1.0	0.5	1.8	3.3	2.3	0.7	3.0	6.0	2.3	2.0	2.7	7.0	1.0	0.0	1.0	2.0	2.0	0.0	1.0	2.0				
7	Organisational impact	Improve competitiveness, effectiveness and flexibility of a whole organisation	7.1+ + 7.1 0	2	1	2	5	-	-	-	-	2	1	1	4	-	-	-	-	2	2	2	6	2	0	3	5	-	-	-	-				
		Build a foundation for CI	7.2+ +	2	0	1	3	2	0	3	5	-	-	-	-	2	1	3	6	-	-	-	-	2	0	3	5	-	-	-	-				
		Create agile and LO	7.3+ +	-	-	-	-	-	-	-	-	1	0	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		Not interrupting operations	7.4+ +	-	-	-	-	-	-	-	-	3	0	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		Motivate intensive training	7.5+ +	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-				
		Improve organisational culture	7.6+ +	2	1	2	5	-	-	-	-	-	-	-	-	2	2	2	6	-	-	-	-	-	-	-	-	-	-	-	-				
		Articulate business needs for change and improvement	7.7+ +	-	-	-	-	2	0	2	4	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3	7	-	-	-	-				
		Accelerate and maintain organisational improvement efforts	7.8+ +	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	4	-	-	-	-				
		Motivate quality awareness and increase total participation	7.9+ +	2	2	3	7	3	1	3	7	-	-	-	-	1	0	1	2	-	-	-	-	1	0	1	2	-	-	-	-				
		Average	+	2	1	2	5	2.3	0.3	2.7	5	2	0.3	2	4.3	1.5	1	2	4.5	2	2	2	6	1.6	0.6	2.4	4.6	-	-	-	-				
		Total	0	81.00			87.00				44.00			65.00				52.00			53.00														
		Average	0 and -	-	-	-	-	3	3	3	-	-	-	-	-	1	0.5	1.5	-	2.5	1	1.5	-	-	-	-	-	-	-	-	-				
		Total	All	81.00			96.00				44.00			71.00				62.00			53.00														

S = Influential paper, E = Empirical Evidence, C = consensus/ substantial agreement  
 1 = Some evidence and presence, 2 = Considerable evidence and presence, 3 = Strong and overwhelming (more than 3 papers), 0 = No Evidence, \* = Not found in the articles

**Appendix 18: Organisation chart of The Siam Cement Group**



**Appendix 19: Reasons for undertaking improvement programmes at SCG**



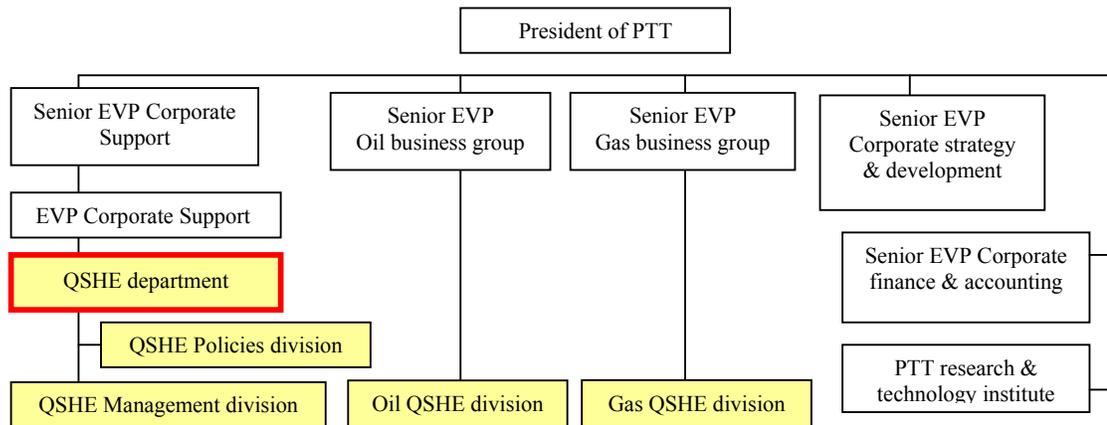
## Appendix 20: CI activities in SRIC

Question	Description	Staff (26)	Percent	Employees (15)	Percent	Total (41)	Percentage	
1) CI activities	TQM	24	92%	15	100%	39	95%	
	ISO9001	20	77%	9	60%	29	71%	
	Self assessment	11	42%	3	20%	14	34%	
	Lean	3	12%	0	0%	3	7%	
	TPM	2	8%	0	0%	2	5%	
	BSC	1	4%	0	0%	1	2%	
2) Quality techniques and tools	5S	23	88%	15	100%	38	93%	
	7QC tools	24	92%	13	87%	37	90%	
	SPC	15	58%	7	47%	22	54%	
	QFD	8	31%	2	13%	10	24%	
	DOE	8	31%	1	7%	9	22%	
	FMEA	7	27%	2	13%	9	22%	
	7Mgt. tools	2	8%	1	7%	3	7%	
	Daily Mgt.	2	8%	0	0%	2	5%	
	Why-Why	1	4%	0	0%	1	2%	
4, 5) Motive Factors	Gr.1	Daily work	16	62%	9	60%	25	61%
		Self-improvement	8	31%	5	33%	13	32%
		Recognition	6	23%	4	27%	10	24%
		Rewards	0	0%	2	13%	2	5%
	Gr.2	Operating performance	5	19%	4	27%	9	22%
		Business result	4	15%	4	27%	8	20%
	Gr.3	Teamwork	3	12%	4	27%	7	17%
		Challenging	5	19%	0	0%	5	12%
		Good purpose	1	4%	2	13%	3	7%
	Gr.4	Time	2	8%	0	0%	2	5%
Top support		2	8%	0	0%	2	5%	
8.1) When is the time to do CI	Regular work time	18	69.2%	9	60.0%	27	66%	
	Unpaid overtime	7	26.9%	3	20.0%	10	24%	
	Paid overtime	0	0.0%	0	0.0%	0	0%	
8.2) How CI activity carried out	As an occasional	10	38.5%	6	40.0%	16	39%	
	Regular work meetings	5	19.2%	2	13.3%	7	17%	
	Dedicated CI meetings	3	11.5%	2	13.3%	5	12%	
Question		Average Staff (26)	Statistics	Average Employees (15)	Statistics	Average Total (41)	Statistics	
7) Time spend in QI activities (Hrs per week) [working hrs= 8hrs/day *5 days/week = 40 hrs/week]		11.57	Max = 40 Min = 2.5 Mode=15	9.00	Max =40 Min = 1 Mode =8	10.64	Max =40 Min =1 Mode =8	
9) Number of suggestions per year		5	Max =12 Min = 0 Mode =3	4	Max =12 Min = 1 Mode =2	5	Max =12 Min = 0 Mode =2	
10) Training hours per year		43.11	Max=100 Min = 0 Mode=80	35.00	Max=100 Min = 0 Mode=0	39.97	Max=100 Min = 0 Mode=80/0	

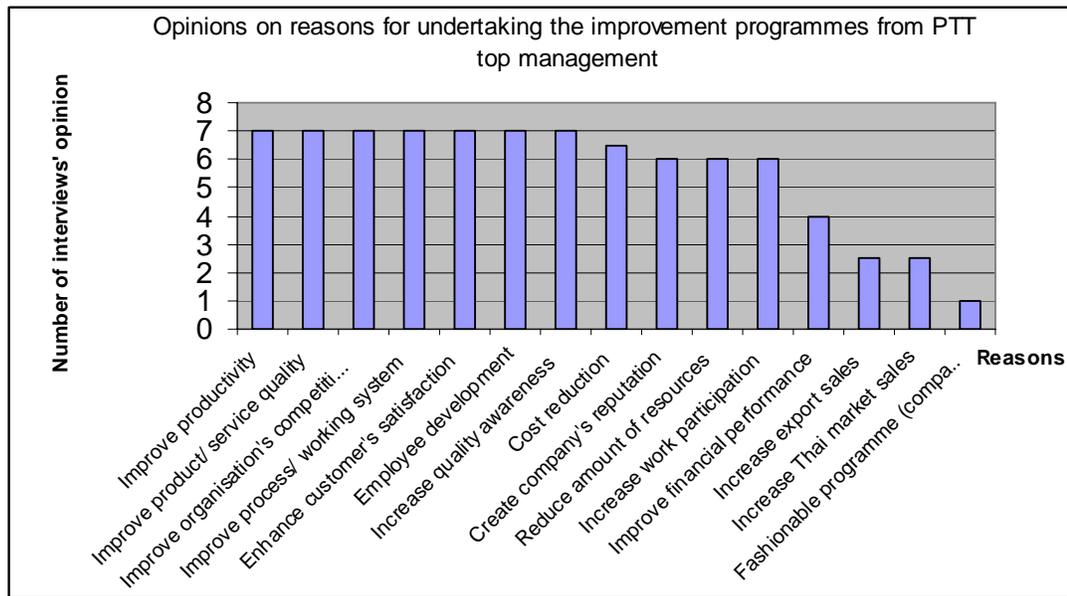
## Appendix 21: Attitude of employee on quality improvement programme in SRIC

No.	Employee's attitude on quality improvement programme in SRIC	Staff (26)		Employee (15)		Total SRIC (41)					Conclusions on benefits of CI activities in SRIC		
		No	Yes	No	Yes	Frequency					No	Yes	
						1 Not at all	2 Very less	3 Less	4 Much	5 Very much			
1	Reduce product/service nonconformities or defects	0%	100%	20%	80%	0	0	3	28	10	7%	93%	Significantly agree (Yes >80%)
2	Increase productivity	12%	88%	0%	100%	0	0	3	26	12	7%	93%	
24	Motivate quality awareness and increase total participations in improving organisation	15%	85%	7%	93%	0	2	3	28	8	12%	88%	
34	In overall, you think CI activities should continue and you are happy to be a participant.	12%	88%	14%	86%	0	0	5	27	8	13%	88%	
16	Build a foundation for continuous improvement	12%	88%	20%	80%	0	0	6	22	13	15%	85%	
15	Improve competitiveness, effectiveness and flexibility of a whole organisation	19%	81%	7%	93%	0	0	6	29	6	15%	85%	
17	Create agile and learning organisation	15%	85%	13%	87%	0	1	5	25	10	15%	85%	
23	Accelerate and maintain organisational improvement efforts, and energize employees	15%	85%	13%	87%	1	0	5	32	3	15%	85%	Agree (Yes >70%)
9	Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	27%	73%	13%	87%	0	2	7	30	2	22%	78%	
31	Top management commitment is important	19%	81%	27%	73%	1	1	7	21	11	22%	78%	
32	Effective communication and feedback are important	19%	81%	27%	73%	0	3	6	21	11	22%	78%	
33	Effective teamworking, people engagement and empowerment are	19%	81%	27%	73%	0	3	6	21	11	22%	78%	
6	Reduce process variability, create process stability, stable variation, process predictability and control	19%	81%	33%	67%	0	1	9	17	14	24%	76%	
4	Increase dexterity or flexibility of workman	31%	69%	20%	80%	0	1	10	28	2	27%	73%	
11	Improve workflow, reduce NVA, and waste	27%	73%	27%	73%	1	1	9	24	6	27%	73%	Agree to some extend (Yes >60%)
14	Monitoring process improvement progress	27%	73%	29%	71%	0	1	10	26	3	28%	73%	
3	Reduce amount of resource usages (Time/ people/ materials etc)	23%	77%	47%	53%	1	0	12	21	7	32%	68%	
21	Improve organisational culture, R&R	35%	65%	27%	73%	0	1	12	23	5	32%	68%	
28	Large transformation and cause cultural change	35%	65%	27%	73%	1	1	11	23	5	32%	68%	
7	Provide formalised, systematic and practical improvement methodology	31%	69%	33%	67%	0	1	12	25	3	32%	68%	
5	Provide rewards and recognition	31%	69%	47%	53%	1	3	11	24	2	37%	63%	
8	Provide a set of quality improvement tools	38%	62%	33%	67%	0	2	13	24	2	37%	63%	Neither nor (Yes= 40-60%)
12	Create fast, flexible, and accessible information (transparent business processes)	46%	54%	29%	71%	0	2	14	18	6	40%	60%	
13	Enhance inventory management	46%	54%	33%	67%	1	1	15	22	2	41%	59%	
20	Motivate intensive trainings	57%	43%	25%	75%	0	0	11	15	0	42%	58%	
10	Foundation for process documentation, maintainable systems	50%	50%	33%	67%	0	1	17	21	2	44%	56%	
18	Not interrupting operations	46%	54%	40%	60%	0	4	14	19	4	44%	56%	
22	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)	46%	54%	53%	47%	1	3	16	17	4	49%	51%	
19	Not require involvement from the whole organisation	54%	46%	53%	47%	1	2	19	18	1	54%	46%	Disagree (Yes <40%)
29	Focus too much on process not enough on practice or people	54%	46%	53%	47%	1	5	16	17	2	54%	46%	
30	Too slow to face with rapid changing competitive requirement	52%	48%	67%	33%	2	6	15	15	2	58%	43%	
25	Resource and time consuming, distract your own work	69%	31%	73%	27%	5	6	18	10	2	71%	29%	
27	No instruction of which tools to be used when and how	77%	23%	73%	27%	1	8	22	10	0	76%	24%	
26	High investments on each projects or on implementation	76%	24%	86%	14%	2	4	25	8	0	79%	21%	

**Appendix 22: QSHE organisation structure at PTT**



**Appendix 23: Reasons for undertaking improvement programmes at PTT**



## Appendix 24: QSHE activities in PTT

Question	Description	Gas (7)	Percent	Oil (10)	Percent	Office (3)	Percent	Total (20)	Percentage	
1) CI activities	TQM (5S, QCC, Suggestion system)	7	100%	9	90%	3	100%	19	95%	
	ISO9001	7	100%	10	100%	2	67%	19	95%	
	Self assessment (TQA)	6	86%	2	20%	1	33%	9	45%	
	TPM	1	14%	5	50%	1	33%	7	35%	
	Six Sigma	5	71%	0	0%	0	0%	5	25%	
	BPR	2	29%	1	10%	2	67%	5	25%	
2) Quality Techniques and Tools	5S	7	100%	10	100%	3	100%	20	100%	
	7QC tools	6	86%	10	100%	2	67%	18	90%	
	SPC/ control chart	6	86%	8	80%	1	33%	15	75%	
	Process mapping	4	57%	7	70%	3	100%	14	70%	
	7Management tools	4	57%	0	0%	1	33%	5	25%	
	DOE	3	43%	0	0%	1	33%	4	20%	
	Advance process control	2	29%	0	0%	0	0%	2	10%	
	FMEA	1	14%	0	0%	1	33%	2	10%	
4, 5) Motive Factors	Gr.1	Daily work	5	71%	7	70%	1	33%	13	65%
		Recognition	4	57%	2	20%	2	67%	8	40%
		Self-improvement	0	0%	5	50%	1	33%	6	30%
		Work promotion	0	0%	3	30%	1	33%	4	20%
	Gr.2	Business result	4	57%	4	40%	2	67%	10	50%
		Operating performance	2	29%	2	20%	0	0%	4	20%
	Gr.3	Teamwork	2	29%	4	40%	1	33%	7	35%
		Integration of similar activities	2	29%	1	10%	1	33%	4	20%
		Frequent announcement	2	29%	2	20%	1	33%	5	25%
	Gr.4	Challenging	1	14%	0	0%	0	0%	1	5%
		Top support	1	14%	4	40%	1	33%	6	30%
		Budget provide	1	14%	0	0%	0	0%	1	5%
	8.1) When is the time to do CI	Regular work time	7	100%	10	100%	2	67%	19	95%
		Unpaid overtime	4	57%	1	10%	1	33%	6	30%
Paid overtime		1	14%	0	0%	0	0%	1	5%	
8.2) How CI activity carried out	As an occasional meeting	0	0%	7	70%	3	100%	10	50%	
	Regular work meetings	3	43%	10	100%	0	0%	13	65%	
	Dedicated CI meetings	5	71%	0	0%	0	0%	5	25%	
Question	Average Gas unit (7)	Statistics	Average Oil unit (10)	Statistics	Average Office (3)	Statistics	Average Total (20)	Statistics		
7) Time spend in QI activities (Hrs per week) [working hrs= 8hrs/day *5 days/week = 40 hrs/week]	34	Max =40 Min = 5 Mode=40	20	Max=40 Min=0.8 Mode=40	27	Max =40 Min = 14 Mode=n/a	25.5	Max = 40 Min = 0.8 Mode= 40		
9) Number of suggestions per year	1	Max = 2 Min = 0 Mode=1	1	Max = 6 Min =0 Mode=1	41	Max=120 Min = 1 Mode=n/a	7	Max = 120 Min = 0 Mode= 1		
10) Training hours per year	63	Max = 80 Min = 0 Mode=80	78	Max = 96 Min = 24 Mode=96	120	Max=288 Min =24 Mode=n/a	80	Max = 288 Min = 0 Mode= 96		

**Appendix 25: Attitude of employees on QSHE programmes in PTT**

No.	Employee's attitude on the benefits of QSHE programmes	Gas (7)		Oil (10)		Office (3)		Total PTI (20)					Conclusions on benefits of QSHE activities in PTI			
		No	Yes	No	Yes	No	Yes	Frequency							No	Yes
								1	2	3	4	5				
								Not at all	Very low	Low	Medium	Very much				
1	Reduce product/service nonconformities or defects	0	7	0	10	0	3	0	0	0	17	3	0%	100%	Significantly agree (Yes >90%)	
15	Improve competitiveness, effectiveness and flexibility of a whole organisation	0	7	0	10	0	3	0	0	0	13	7	0%	100%		
16	Build a foundation for continuous improvement	0	7	0	10	0	3	0	0	0	13	7	0%	100%		
9	Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	0	7	1	9	0	3	1	0	0	11	8	5%	95%		
10	Foundation for process documentation, maintainable systems	1	6	0	10	0	3	0	0	1	11	8	5%	95%		
33	Effective teamworking, people engagement and empowerment are important	0	7	0	10	1	2	0	0	1	11	8	5%	95%		
2	Increase productivity	0	7	1	9	0	3	0	0	1	15	4	5%	95%		
32	Effective communication and feedback are important	0	7	0	10	1	2	0	0	1	12	7	5%	95%		
14	Monitoring process improvement progress	0	7	1	8	0	3	0	0	1	15	3	5%	95%		
6	Reduce process variability, create process stability, stable variation, process predictability and control	1	6	1	9	0	3	1	0	1	15	3	10%	90%	Agree (Yes >80%)	
12	Create fast, flexible, and accessible information (transparent business processes)	1	6	1	9	0	3	0	0	2	15	3	10%	90%		
24	Motivate quality awareness and increase total participations in improving organisation	0	7	1	9	1	2	0	0	2	15	3	10%	90%		
34	In overall, you think CI activities should continue and you are happy to be a participant.	0	7	1	9	1	2	0	0	2	12	6	10%	90%		
7	Provide formalised, systematic and practical improvement methodology	0	7	2	8	1	2	0	0	3	13	4	15%	85%		
17	Create agile and learning organisation	0	7	3	7	0	3	1	0	2	13	4	15%	85%		
22	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)	0	7	3	7	0	3	0	0	3	13	4	15%	85%		
31	Top management commitment is important	0	7	2	8	1	2	0	0	3	10	7	15%	85%		
23	Accelerate and maintain organisational improvement efforts, and	1	6	2	8	1	2	0	0	4	13	3	20%	80%	Agree to some extend (Yes >60%)	
8	Provide a set of quality improvement tools	1	6	3	7	1	2	0	0	5	10	5	25%	75%		
21	Improve organisational culture, R&R	1	6	3	7	1	2	1	0	4	13	2	25%	75%		
20	Motivate intensive trainings	2	5	2	8	1	1	0	0	5	11	3	26%	74%		
11	Improve workflow, reduce NVA, and waste	1	6	5	5	0	3	1	1	4	12	2	30%	70%		
3	Reduce amount of resource usages (Time/ people/ materials etc)	0	7	5	5	2	1	0	2	5	11	2	35%	65%		
13	Enhance inventory management	3	4	4	6	0	3	1	1	5	12	1	35%	65%		
18	Not interrupting operations	0	7	6	4	1	2	0	0	7	12	1	35%	65%		
4	Increase dexterity or flexibility of workman	2	5	5	5	2	1	0	2	7	8	3	45%	55%	Neither nor (Yes= 40-60%)	
5	Provide rewards and recognition	3	4	6	4	1	2	0	1	9	9	1	50%	50%		
28	Large transformation and cause cultural change	3	4	6	4	2	1	2	1	8	8	1	55%	45%		
19	Not require involvement from the whole organisation	3	4	8	2	1	2	5	2	5	7	1	60%	40%		
26	High investments on each projects or on implementation	5	2	9	1	2	1	1	6	9	4	0	80%	20%	Disagree (Yes <40%)	
29	Focus too much on process not enough on practice or people	7	0	7	3	2	1	2	3	11	4	0	80%	20%		
27	No instruction of which tools to be used when and how	6	1	8	1	1	1	3	5	7	3	0	83%	17%		
25	Resource and time consuming, distract your own work	7	0	8	2	2	1	3	4	10	3	0	85%	15%		
30	Too slow to face with rapid changing competitive requirement	6	1	10	0	3	0	3	6	10	1	0	95%	5%		

## Appendix 26: Johnson and Johnson Credo

“We believe our first responsibility is to **the doctors, nurses and patients, to mothers and fathers and all others who use our products and services.** In meeting their needs everything we do must be of high quality. We must constantly strive to reduce our costs in order to maintain reasonable prices. Customers’ orders must be serviced promptly and accurately. Our suppliers and distributors must have an opportunity to make a fair profit.

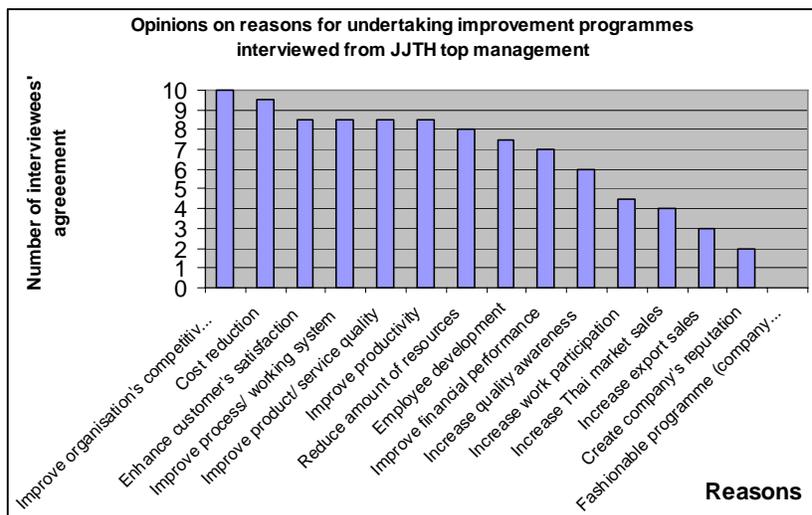
We are responsible to **our employees**, the men and women who work with us throughout the world. Everyone must be considered as an individual. We must respect their dignity and recognize their merit. They must have a sense of security in their jobs. Compensation must be fair and adequate, and working conditions clean, orderly and safe. We must be mindful of ways to help our employees fulfill their family responsibilities. Employees must feel free to make suggestions and complaints. There must be equal opportunity for employment, development, and advancement for those qualified. We must provide competent management and their actions must be just and ethical.

We are responsible to **the communities** in which we live and work and to the world community as well. We must be good citizens - support good works and charities and bear our fair share of taxes. We must encourage civic improvements and better health and education. We must maintain in good order the property we are privileged to use, protecting the environment and natural resources.

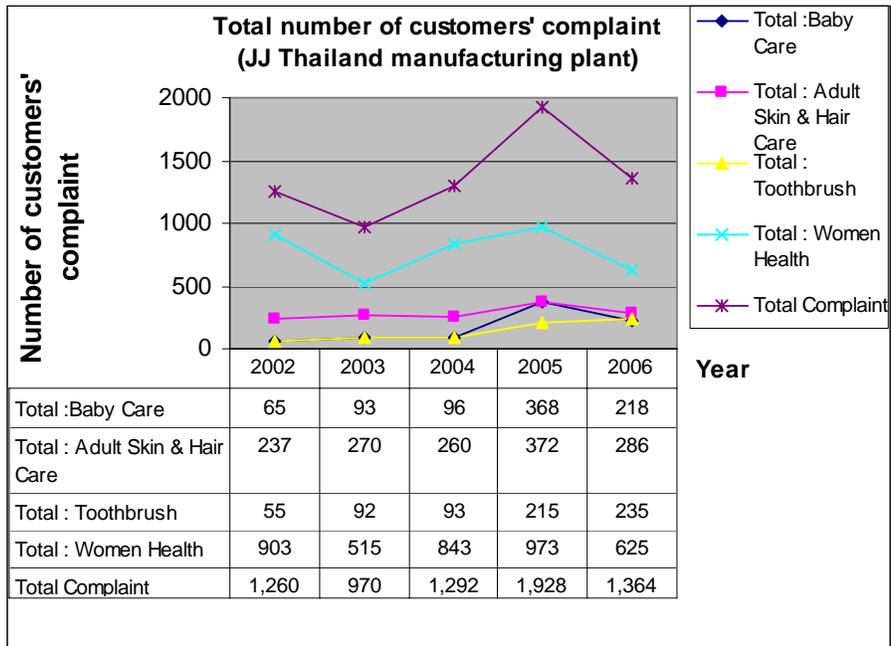
Our final responsibility is to **our stockholders.** Business must make a sound profit. We must experiment with new ideas. Research must be carried on, innovative programs developed and mistakes paid for. New equipment must be purchased, new facilities provided and new products launched. Reserves must be created to provide for adverse times. When we operate according to these principles, the stockholders should realize a fair return

(Johnson & Johnson 2007).”

## Appendix 27: Reasons for undertaking improvement programmes at JJTH



**Appendix 28: Total number of customers' complaint in JJTH**



**Appendix 29: Improvement activities in JJTH**

Question	Description	J1	J2	J3	J4	J5	J6	J7	J8	J9	JJTH (9)	Percent	
1) CI activities	Six Sigma	1	1	1	1	1	1	1	1	1	8	89%	
	GMP		1	1	1	1	1	1	1	1	8	89%	
	Lean	1	1	1		1	1	1		1	7	78%	
	OEE			1		1			1	1	4	44%	
	ISO14000		1	1					1		3	33%	
	CIP									1	1	11%	
2) Quality Techniques and Tools	5S	1	1	1	1	1	1		1	1	8	80%	
	DOE	1	1	1	1		1	1		1	7	70%	
	FMEA	1	1		1		1	1		1	6	60%	
	SPC/ control chart	1	1	1		1		1		1	6	60%	
	Process mapping	1	1			1				1	4	40%	
	7QC tools		1	1			1			1	4	40%	
	Six Sigma tools	1			1						2	20%	
	Why-Why	1	1								2	20%	
4, 5) Motive Factors	Gr.1	Daily work			1	1	1					3	33%
		Recognition		1			1			1		3	33%
		Self-improvement		1	1	1						3	33%
		Happiness		1								1	11%
	Gr.2	Business result		1				1	1			3	33%
		Operating performance				1		1		1		3	33%
	Gr.3	Challenging	1							1	1	3	33%
		Root cause analysis		1								1	11%
Gr.4	Top management support					1	1				2	22%	
8.1) When is the time to do CI	Regular work time	1	1	1	1	1	1	1	1	1	9	90%	
	Unpaid overtime					1			1	1	3	30%	
	Paid overtime										0	0%	
8.2) How CI activity carried out	As an occasional meeting	1		1		1			1		4	40%	
	Regular work meetings					1	1	1		1	4	40%	
	Dedicated CI meetings	1	1		1						3	30%	
Question	J1	J2	J3	J4	J5	J6	J7	J8	J9	Average (9)	Statistics		
7) Time spend in QI activities (Hrs per week) [working hrs= 8hrs/day *5 days/week = 40 hrs/week]	40	n/a	2	5	40	40	48	40	40	32	Max=48 Min=2 Mode=40		
9) Number of suggestions per year	6	3	2	10	8	12	12	0	0	6	Max = 12 Min =0 Mode=0,12		
10) Training hours per year	40	36	n/a	72	96	80	80	n/a	80	69	Max = 96 Min = 36 Mode=80		

**Appendix 30: Attitude of employees on improvement programmes in JJTH**

No.	Employee's attitude on the benefits of improvement programmes	JJTH									Total JJTH (9)					Conclusions on benefits of QSHE activities in PTT		
											Frequency							
		J1	J2	J3	J4	J5	J6	J7	J8	J9	1 Not at all	2 Very less	3 Less	4 Much	5 Very much		No	Yes
1	Reduce product/service nonconformities or defects	5	4	5	5	4	5	5	4	5	0	0	0	3	6	0%	100%	Significantly agree (Yes=100%)
2	Increase productivity	5	5	4	5	4	4	5	4	5	0	0	0	4	5	0%	100%	
3	Reduce amount of resource usages (Time/ people/ materials etc)	5	5	4	4	4	4	4	4	5	0	0	0	6	3	0%	100%	
9	Promote work and procedural standardization, and help understand core systems/ processes and critical linkages	4	5	5	4	4	5	4	4	5	0	0	0	5	4	0%	100%	
12	Create fast, flexible, and accessible information (transparent business processes)	4	4	4	4	4	4	4	4	4	0	0	0	9	0	0%	100%	
31	Top management commitment is important	4	4	5	5	5	5	5	5	5	0	0	0	2	7	0%	100%	
33	Effective teamworking, people engagement and empowerment are important	4	4	5	5	4	4	5	5	5	0	0	0	4	5	0%	100%	
34	In overall, you think CI activities should continue and you are happy to be a participant.	4	5	5	5	4	4	4	4	4	0	0	0	6	3	0%	100%	
6	Reduce process variability, create process stability, stable variation, process predictability and control	5	4	4	4	3	4	5	4	4	0	0	1	6	2	11%	89%	Agree (Yes >80%)
11	Improve workflow, reduce NVA, and waste	4	5	4	4	3	5	4	4	5	0	0	1	5	3	11%	89%	
15	Improve competitiveness, effectiveness and flexibility of a whole organisation	3	4	4	5	5	5	5	4	5	0	0	1	3	5	11%	89%	
16	Build a foundation for continuous improvement	5	4	5	4	3	5	4	4	5	0	0	1	4	4	11%	89%	
17	Create agile and learning organisation	4	4	4	5	4	5	4	3	5	0	0	1	5	3	11%	89%	
20	Motivate intensive trainings	4	4	5	5	3	4	4	4	5	0	0	1	5	3	11%	89%	
21	Improve organisational culture, R&R	4	4	5	4	3	4	5	4	5	0	0	1	5	3	11%	89%	
24	Motivate quality awareness and increase total participations in improving organisation	4	5	4	5	3	5	4	5	5	0	0	1	3	5	11%	89%	
32	Effective communication and feedback are important	5	4	5	5	2	5	5	5	5	0	1	0	1	7	11%	89%	
14	Monitoring process improvement progress	3	4	4	4	3	5	4	4	5	0	0	2	5	2	22%	78%	Agree to some extend (Yes >60%)
18	Not interrupting operations	4	4	5	2	4	5	3	5	4	0	1	1	4	3	22%	78%	
23	Accelerate and maintain organisational improvement efforts, and energize employees	4	5	4	4	3	4	3	4	5	0	0	2	5	2	22%	78%	
4	Increase dexterity or flexibility of workman	5	4	3	3	4	4	3	4	4	0	0	3	5	1	33%	67%	
10	Foundation for process documentation, maintainable systems	3	4	4	4	2	5	4	3	4	0	1	2	5	1	33%	67%	
13	Enhance inventory management	3	4	5	2	4	5	4	3	5	0	1	2	3	3	33%	67%	
22	Articulate the critical business needs for change and improvement	4	4	4	3	3	4	4	3	4	0	0	3	6	0	33%	67%	
5	Provide rewards and recognition	3	4	3	3	4	5	3	5	5	0	0	4	2	3	44%	56%	Neither nor (Yes= 40-60%)
7	Provide formalised, systematic and practical improvement methodology	5	5	3	3	2	5	4	3	4	0	1	3	2	3	44%	56%	
8	Provide a set of quality improvement tools	5	5	4	2	3	5	3	3	5	0	1	3	1	4	44%	56%	
26	High investments on each projects or on implementation	1	3	2	4	4	2	4	3	4	1	2	2	4	0	56%	44%	
30	Too slow to face with rapid changing competitive requirement	3	3	4	4	4	2	4	3	2	0	2	3	4	0	56%	44%	
28	Large transformation and cause cultural change	4	3	3	3	3	3	3	4	4	0	0	6	3	0	67%	33%	Disagree (Yes <40%)
29	Focus too much on process not enough on practice or people	3	3	2	4	4	1	4	2	3	1	2	3	3	0	67%	33%	
19	Not require involvement from the whole organisation	3	4	4	2	3	1	3	1	3	1	3	2	0	78%	22%		
27	No instruction of which tools to be used when and how	2	3	1	2	5	3	4	1	2	2	3	2	1	1	78%	22%	
25	Resource and time consuming, distract your own work	1	4	2	3	2	1	3	1	2	3	3	2	1	0	89%	11%	

### Appendix 31: Rating scores in the importance of pay-off and implications

Category	No.	Sub-category	Rating score *										Importance #	
			Experts (13)	SCG (10)	PTT (7)	JJTH (10)	AIS (3)	Toyota (1)	Average (44)	Mode (44)	Average Category	Mode	Sub-category	Category
1.Shareholders	1.1	Increase stockmarket price	1.4	1.2	1.6	1.8	2.3	3.0	1.6	3	1.57	3	Medium	Medium
2.Company performance	2.1	Financial performance	2.4	2.8	2.0	2.8	2.8	3.0	2.6	3	2.63	3	High	High
	2.2	Quality performance	2.8	2.9	3.0	2.7	3.0	3.0	2.9	3			High	
	2.3	Productivity	2.8	3.0	3.0	2.8	2.7	2.0	2.8	3			High	
3.Marketing performance	3.1	Market share/ Brand recognition	2.1	2.6	2.3	2.2	2.7	2.0	2.3	2	2.15	2	Medium	Medium
	3.2	Internationally recognized standard	2.1	2.1	2.4	1.8	1.0	1.0	2.0	2			Medium	
4.Customers	4.1	Customer's satisfaction	2.9	3.0	2.9	2.6	3.0	3.0	2.9	3	2.86	3	High	High
5.Human Resources	5.1	Reduce number of employees	1.4	1.1	1.1	1.2	1.0	0.0	1.2	1	1.95	2	Low	Medium
	5.2	Reduce amount of resources usage	2.1	1.9	2.1	2.2	1.3	1.0	2.0	2			Medium	
	5.3	Increase dexterity or flexibility of employees	2.4	2.6	2.4	2.1	1.7	3.0	2.3	3			Medium	
	5.4	Provide rewards and recognition	2.2	2.0	2.0	2.0	1.7	2.0	2.0	2			Medium	
	5.5	Employees' attitude to organisation	2.6	2.1	2.0	2.3	2.0	2.0	2.2	3			Medium	
6.Process Improvement	6.1	Process innovation breakthrough	2.7	2.7	2.5	2.5	2.0	3.0	2.6	3	2.60	3	High	High
	6.2	Reduce process variability, create process stability	2.8	2.9	2.8	2.2	2.7	3.0	2.7	3			High	
	6.3	Provide formalised, systematic and practical improvement methodology	2.5	2.8	2.8	2.4	2.0	3.0	2.6	3			High	
	6.4	Provide a set of quality improvement tools	2.3	2.8	2.5	2.4	2.7	3.0	2.5	3			High	
	6.5	Promote work and procedural standardization	2.6	2.9	2.8	2.5	2.3	3.0	2.7	3			High	
	6.6	Foundation for process record for tractability, a maintainable systems	2.5	2.7	2.8	2.4	2.7	3.0	2.6	3			High	
	6.7	Improve workflow, reduce NVA, and waste	2.8	2.9	2.8	2.7	2.3	3.0	2.8	3			High	
	6.8	Create fast, flexible, and accessible	2.7	2.8	2.8	2.2	2.0	3.0	2.6	3			High	
	6.9	Enhance inventory management	2.3	2.5	2.5	2.6	1.0	3.0	2.4	3			Medium	
	6.10	Monitoring process improvement progress	2.8	2.6	2.8	2.4	2.3	3.0	2.7	3			High	
7.Organisational benefits	7.1	Fashionable technique/ Company image	1.8	0.5	1.2	0.8	0.3	2.0	1.1	0	2.26	3	Low	Medium
	7.2	Improve competitiveness, effectiveness and flexibility of a whole organisation	2.7	2.9	2.8	2.8	3.0	3.0	2.8	3			High	
	7.3	Build a foundation for continuous improvement	2.8	2.9	3.0	2.8	3.0	3.0	2.9	3			High	
	7.4	Create agile and learning organisation	2.4	2.7	2.7	2.6	2.7	2.0	2.6	3			High	
	7.5	Not interrupting operations or not require involvement from the whole organisation	1.5	1.8	2.0	1.2	0.7	0.0	1.5	2			Low	
	7.6	Motivate intensive trainings	2.1	2.1	2.5	1.7	0.7	3.0	2.0	2			Medium	
	7.7	Improve organisational culture	2.2	2.6	2.5	2.3	2.3	3.0	2.4	2			Medium	
	7.8	Articulate the critical business needs for change and improvement (Gain outsiders or expert review)	2.2	2.4	2.2	2.9	0.7	3.0	2.3	3			Medium	
	7.9	Accelerate and maintain organisational improvement efforts	2.5	2.8	2.3	2.7	2.0	3.0	2.6	3			High	
	7.10	Motivate quality awareness and increase total participations in improving organisation	2.7	2.8	2.7	2.5	2.0	3.0	2.6	3			High	
8.Resource consumption	8.1	Resource and time consuming	2.3	2.4	2.3	2.1	1.7	1.0	2.2	2	2.05	2	Medium	Medium
	8.2	High investments	1.7	2.0	1.7	2.3	1.7	2.0	1.9	2			Medium	
9.Impact of the programme to organisation	9.1	No instruction of which tools to be used when and how	1.8	2.3	1.7	2.4	0.7	0.0	1.9	3	2.17	3	Medium	Medium
	9.2	quality performance will not improve If the followed processes are not suitable for product/services.	2.1	2.4	2.5	2.3	3.0	3.0	2.3	3			Medium	
	9.3	Not cover all requirements for business improvement criteria (MBNQA)	1.5	1.4	1.0	1.8	1.0	0.0	1.4	2			Low	
	9.4	Focus on whole organisation rather than functions	2.2	2.4	2.5	2.6	2.7	3.0	2.4	3			Medium	
	9.5	Large transformation and cultural change	1.9	2.5	2.5	2.3	2.0	3.0	2.3	3			Medium	
	9.6	Focus too much on process not enough on practice or people	2.1	2.6	1.8	2.8	2.3	3.0	2.4	3			Medium	
	9.7	Take long time to see the results	2.0	3.0	1.8	3.0	2.3	3.0	2.5	3			Medium	
10.Critical Success Factor	10.1	Should extended to company's supply chain to maximize program	1.8	2.4	2.2	2.5	2.0	1.0	2.1	3	2.71	3	Medium	High
	10.2	Top management commitment	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3			High	
	10.3	Effective communication and feedback	2.7	3.0	2.8	2.9	2.0	3.0	2.8	3			High	
	10.4	Effective teamworking, people engagement and empowerment	2.8	2.9	3.0	3.0	2.5	3.0	2.9	3			High	

\* Rating score to the degree of importance of sub-categories (Not significant =0, Significant but low =1, Medium =2, and High=3)  
# Importance (Average rating score >= 2.5 considers High importance, >= 1.5 Medium, >= 0.5 Low, and lower than 0.5 = Not significance)

## Appendix 32: Selection matrix and performance profiles from Essilor China plant

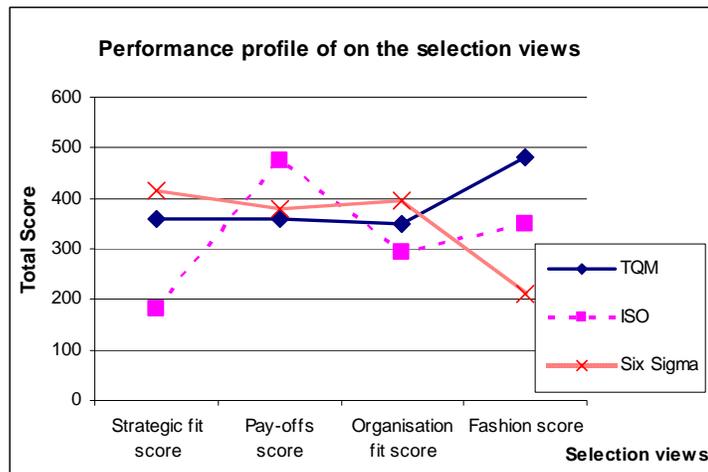
### Selection matrix of management tools

Company's name: .....Essilor Manufacturing (China)

Date: ...30 March 2006.....

Type of industry: Manufacturing or Service, Type of product/ service: ...Contact Lenses.....

Selection's views	Area Weight	No.	Sub-Criteria	Company's Importance	Rate Initiatives					
					TQM		ISO		Six Sigma	
					Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
<b>Strategic Fit</b> (Direction/ vision, KPI, OW/OQ)	0.40	1	Cost	30	5	150	1	30	4	120
		2	Quality	30	5	150	3	90	5	150
		3	Speed	25	1	25	1	25	4	100
		4	Dependability	10	3	30	3	30	3	30
		5	Flexibility	5	1	5	1	5	3	15
<b>Pay-Offs</b>	0.30	1	Shareholder benefits	0	0	0	0	0	0	0
		2	Company performance	10	5	50	4	40	5	50
		3	Marketing performance	0	0	0	0	0	0	0
		4	Customer satisfaction	35	5	175	5	175	5	175
		5	Human resources	15	1	15	4	60	1	15
		6	Process improvement	25	3	75	5	125	5	125
		7	Organisational benefits	15	3	45	5	75	1	15
<b>Organisation Fit</b>	0.20	1	Company capability and readiness	20	3	60	5	100	5	100
		2	Achievement possibility	25	3	75	2	50	4	100
		3	National and organisational culture	5	1	5	1	5	1	5
		4	Commitment from top	30	5	150	4	120	5	150
		5	Infrastructure	20	3	60	1	20	2	40
<b>Fashion</b>	0.10	1	Follow best practices, competitors, books, journal	50	5	250	4	200	3	150
		2	Suggested by consultant, experts	5	1	5	3	15	3	15
		3	Follow fashion	45	5	225	3	135	1	45
EVALUATION	Strategic fit score				360		180		415	
	Pay-offs score				360		475		380	
	Organisation fit score				350		295		395	
	Fashion score				480		350		210	
	Overall score				370		309		380	
Rank				2		3		1		



### Appendix 33: Selection matrix and performance profiles from Essilor Thailand plant

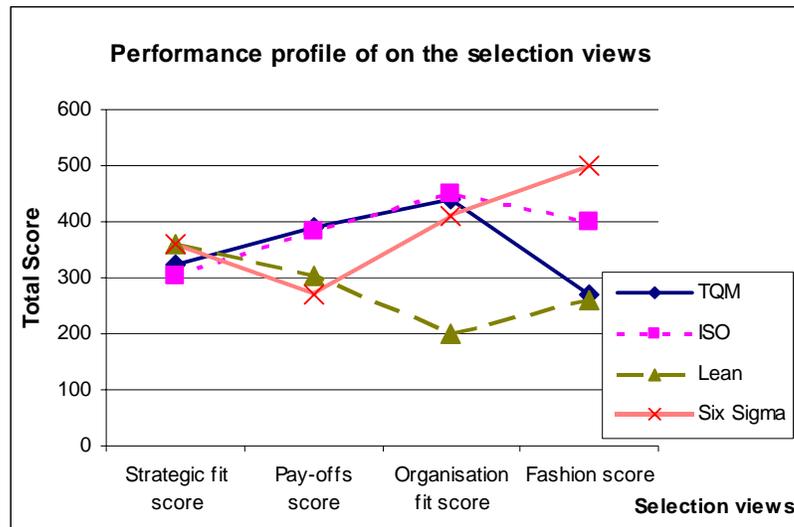
#### Selection matrix of management tools

Company's name: .....Essilor Manufacturing (Thailand)

Date: ...30 March 2006.....

Type of industry: Manufacturing or Service, Type of product/ service: ...Contact Lenses.....

Selection's views	Area Weight	No.	Sub-Criteria	Company's Importance	Rate Initiatives							
					TQM		ISO		Lean		Six Sigma	
					Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Strategic Fit (Direction/ vision, KPI, OW/OQ)	0.30	1	Cost	20	3	60	2	40	4	80	5	100
		2	Quality	30	5	150	4	120	2	60	4	120
		3	Speed	20	2	40	2	40	5	100	1	20
		4	Dependability	15	4	60	5	75	3	45	5	75
		5	Flexibility	15	1	15	2	30	5	75	3	45
Pay-Offs	0.50	1	Shareholder benefits	5	3	15	4	20	3	15	3	15
		2	Company performance	15	4	60	4	60	3	45	3	45
		3	Marketing performance	10	4	40	3	30	4	40	4	40
		4	Customer satisfaction	30	5	150	5	150	2	60	3	90
		5	Human resources	15	3	45	3	45	4	60	2	30
		6	Process improvement	15	4	60	4	60	3	45	2	30
		7	Organisational benefits	10	2	20	2	20	4	40	2	20
Organisation Fit	0.10	1	Company capability and readiness	10	3	30	4	40	2	20	3	30
		2	Achievement possibility	20	5	100	5	100	2	40	3	60
		3	National and organisational culture	10	2	20	2	20	2	20	2	20
		4	Commitment from top	50	5	250	5	250	2	100	5	250
		5	Infrastructure	10	4	40	4	40	2	20	5	50
Fashion	0.10	1	Follow best practices, competitors, books, journal	60	3	180	5	300	3	180	5	300
		2	Suggested by consultant, experts	10	3	30	1	10	2	20	5	50
		3	Follow fashion	30	2	60	3	90	2	60	5	150
EVALUATION	Strategic fit score				325		305		360		360	
	Pay-offs score				390		385		305		270	
	Organisation fit score				440		450		200		410	
	Fashion score				270		400		260		500	
	Overall score				364		369		307		334	
	Rank				2		1		4		3	

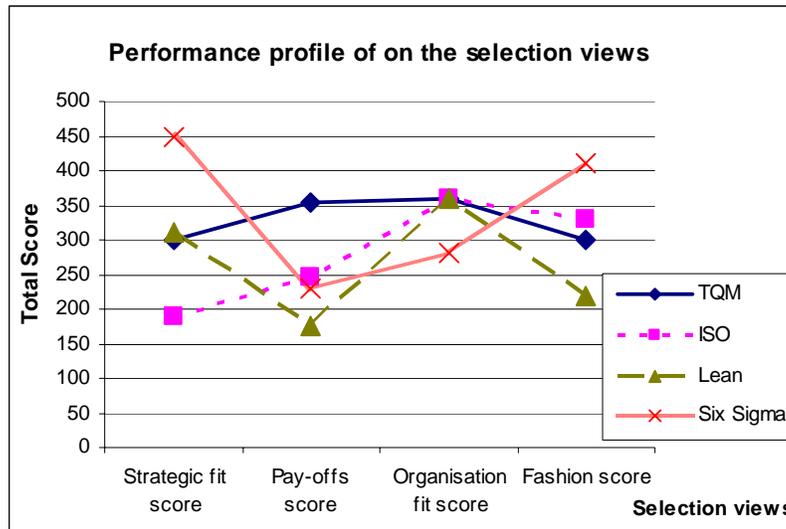


### Appendix 34: Selection matrix and performance profiles from Essilor India plant

#### Selection matrix of management tools

Company's name: .....Essilor Manufacturing (India) Date:..30 March 2006.....  
 Type of industry: Manufacturing or Service, Type of product/ service:..Contact Lenses.....

Selection's views	Area Weight	No.	Sub-Criteria	Company's Importance	Rate Initiatives							
					TQM		ISO		Lean		Six Sigma	
					Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Strategic Fit (Direction/ vision, KPI, OW/OQ)	0.20	1	Cost	40	2	80	1	40	5	200	5	200
		2	Quality	30	5	150	2	60	1	30	4	120
		3	Speed	20	1	20	3	60	3	60	5	100
		4	Dependability	10	5	50	3	30	2	20	3	30
		5	Flexibility	0	0	0	0	0	0	0	0	0
Pay-Offs	0.50	1	Shareholder benefits	15	5	75	3	45	3	45	4	60
		2	Company performance	15	0	0	0	0	0	0	0	0
		3	Marketing performance	20	4	80	3	60	1	20	3	60
		4	Customer satisfaction	10	4	40	3	30	3	30	3	30
		5	Human resources	20	4	80	2	40	1	20	1	20
		6	Process improvement	10	4	40	4	40	3	30	3	30
		7	Organisational benefits	10	4	40	3	30	3	30	3	30
Organisation Fit	0.20	1	Company capability and readiness	20	4	80	4	80	4	80	2	40
		2	Achievement possibility	20	4	80	4	80	4	80	2	40
		3	National and organisational culture	0	0	0	0	0	0	0	0	0
		4	Commitment from top	20	4	80	4	80	4	80	4	80
		5	Infrastructure	40	3	120	3	120	3	120	3	120
Fashion	0.10	1	Follow best practices, competitors, books, journal	30	1	30	4	120	1	30	5	150
		2	Suggested by consultant, experts	60	4	240	3	180	3	180	4	240
		3	Follow fashion	10	3	30	3	30	1	10	2	20
EVALUATION	Strategic fit score				300	190	310	450				
	Pay-offs score				355	245	175	230				
	Organisation fit score				360	360	360	280				
	Fashion score				300	330	220	410				
	Overall score				340	266	244	302				
Rank				1	4	6	2					



**Appendix 35: Selection matrix and performance profiles from SMEs selling company A**

**Selection matrix of management tools**

Company's name: .....Essilor Manufacturing (Phillipines)

Date:...30 March 2006

Type of industry: Manufacturing or Service, Type of product/ service:...Contact Lenses

Selection's views	Area Weight	No.	Sub-Criteria	Company's Importance	Rate Initiatives				
					TQM		ISO		
					Score	Weighted Score	Score	Weighted Score	
<b>Strategic Fit</b> (Direction/ vision, KPI, OW/OQ)	0.50	1	Cost	30	3	90	1	30	
		2	Quality	10	3	30	1	10	
		3	Speed	40	5	200	1	40	
		4	Dependability	10	3	30	1	10	
		5	Flexibility	10	3	30	1	10	
<b>Pay-Offs</b>	0.30	1	Shareholder benefits	10	1	10	3	30	
		2	Company performance	20	1	20	3	60	
		3	Marketing performance	30	1	30	3	90	
		4	Customer satisfaction	10	1	10	3	30	
		5	Human resources	10	1	10	3	30	
		6	Process improvement	10	1	10	3	30	
		7	Organisational benefits	10	1	10	3	30	
<b>Organisation Fit</b>	0.10	1	Company capability and readiness	40	3	120	3	120	
		2	Achievement possibility	30	5	150	1	30	
		3	National and organisational culture	0	2	0	2	0	
		4	Commitment from top	15	2	30	1	15	
		5	Infrastructure	15	1	15	1	15	
<b>Fashion</b>	0.10	1	Follow best practices, competitors, books, journal	50	1	50	3	150	
		2	Suggested by consultant, experts	50	1	50	3	150	
		3	Follow fashion	0	1	0	1	0	
<b>EVALUATION</b>		Strategic fit score				380		100	
		Pay-offs score				100		300	
		Organisation fit score				315		180	
		Fashion score				100		300	
		Overall score				262		188	
		Rank				1		2	

