A STRATEGIC MODEL OF OPERATIONAL
PERFORMANCE IMPROVEMENT

A Thesis
In Operations Management

FABIO ALHER
Supervisor: Nigel Slack

9921489

Presented at the Warwick Business School for the
Degree of Doctor of Philosophy

University of Warwick
Coventry
CV4 7AL
United Kingdom
alher@rocketmail.com
Performance improvement is the natural objective of any intervention in the organisation. Performance improvement in operational terms is particularly interesting when it is able to influence the competitive position of the firm. By being able to deliver superior value and/or offer prices through lower costs a firm will increase customer satisfaction and loyalty and potentially increase its market share and profitability. This research explores the determinants of strategic operational performance improvement, the particular questions we address are: 1) What characterise the process in which the firm achieves operational performance that is strategically significant?, and 2) Why once advantage is achieved, it is not automatically replicated?

The manufacturing strategy model and the literature associated with the resource-based theory provide the theoretical foundations of this work, although the link between the two literatures is problematic because their fundamentals are usually at odds. Because the nature of the work is exploratory, and its purpose is one of theory building, we build a model of strategic operational improvement through grounded research. Four case studies are studied and analysed in order to test and improve the model.

The results provide a number of insights on the role of managerial rationality, managerial behaviour, and the relationship between managerial and workers behaviour. We are also able to address a number of questions on the nature of strategy in operations. The final product of this thesis is model that relates the processes in the organisation to the firm’s initial conditions to explain the evolution of performance. Empirical evidences suggest that the strategic improvement of operational performance depends on the sequence evolution of initial conditions, managerial behaviour, and organisational behaviour. It is argued that by understanding the relationships in this model it is possible to develop more effective operations processes which are able to deliver superior value and or lower costs.
Acknowledgements

A Ph.D. is the result of a long term project (10 years may be) and a few contingencies. Here I will limit myself to name those without whom it would have never happened.

First and foremost is my family. By family I mean my mother (persistence, energy), my father (inspiration, ambition), and my grandmother Maria (a bit of everything). I dedicate this thesis to my grandfather Antonio who could not see this day. Whatever I have and (possibly) will achieve in life is only a consequence of their love and blind commitment to me. They made it really easy for me.

In what concerns more directly the thesis, there are two people that are central to the whole project. Henrique Luis Correa who was the first person to suggest the idea of doing a Ph.D. His love to academic life has passed onto me and has changed the course of my professional life. The second person is Nigel Slack, my supervisor. Throughout these years he has been a source of inspiration. What I know about this field I have learned from him. But above all he is someone that I could always trust.

The best memories I will keep from these years I own them to the friends I have made in Warwick. Life without them would have been unbearably boring.

On the operational side of things I cannot thank enough the managers of SERASA, CIGNA UK, Toshiba UK, and TNT. From most of the people in these companies I received nothing else but total collaboration. There is also CAPES. They provided financial support for most of the project and never let me down. One of the happiest days in my life was the day I found out that I had been awarded the scholarship. I should acknowledge people in the Fundação Vanzolini. They were always very helpful, my special thanks goes to Professor Costa Neto.

Least but obviously not last comes Burcu, my girlfriend. On the top of proof reading my drafts, which were neither exactly exciting nor accomplished examples of fine writing, she coped with long periods of bad temper, whose degree was directly proportional to the difficulty of the chapter being written. For fulfilling my life, thank you.
CHAPTER 1 - INTRODUCTION

1.1. INTRODUCTION

1.2. RESEARCH TOWARD A NEW MODEL

1.3. DECONSTRUCTING THE CONCEPT OF STRATEGY IN OPERATIONS

1.4. NEW DIRECTIONS FOR RESEARCH

CHAPTER 2 - LITERATURE REVIEW

2.1 - INTRODUCTION TO THE MANUFACTURING STRATEGY LITERATURE

2.2. BREAKING WITH THE TAYLORISTIC PARADIGM IN MANUFACTURING

2.3. THE CONCEPT OF MANUFACTURING STRATEGY

2.4. THE CONTEXT OF MANUFACTURING STRATEGY

2.5. MANUFACTURING STRATEGY CONTENT
   2.5.1. Competitive priorities
   2.5.2. Decision areas
   2.6. Manufacturing strategy process

2.7. MANUFACTURING DISTINCTIVE COMPETENCIES

2.8. IMPLICATIONS OF THE MANUFACTURING STRATEGY LITERATURE

2.9. INTRODUCTION TO THE RESOURCE-BASED THEORY

2.10. A NEW STRATEGY PERSPECTIVE AND ECONOMICS
   2.10.1. Internal/external dichotomy
   2.10.2. The RBV and the several schools of thought in economics
   2.10.3. The current paradigm
   2.10.4. Distinct assumptions, incompatible models

2.11. A RESOURCE BASED VIEW OF COMPETITION
   2.11.1 Explaining heterogeneity
   2.11.2. Isolating mechanisms
   2.11.3. Causal Ambiguity
   2.11.4. Uncertain imitability
   2.11.5. Path dependence

2.12. ORGANISATIONAL THEORY AND RESOURCE BASED THEORY
   2.12.1. The concept of organisational routine

2.13. APPLIED MANAGEMENT AND THE RESOURCE BASED THEORY
   2.13.1. Evidences from the operations literature

2.14. LITERATURE DEFINITIONS OF RESOURCES, CAPABILITIES, AND COMPETENCIES
   2.14.1. Definitions
   2.14.2. Abstraction and confusion
2.14.3. Resources, capabilities, and competencies ................................................................. 51
2.15. THE MANAGERIAL RELEVANCE OF THE RESOURCE BASED THEORY .......................... 55
2.16. CONCLUSIONS FROM LITERATURE REVIEW .................................................................. 58
2.16.1. Does a company necessarily need to implement a manufacturing (operations) strategy to have a competitive advantage? .......................................................... 58
2.16.2. How incompatible are the resource-based view and the paradigm of manufacturing strategy? ............................................................................................................. 60
2.16.3. What are the consequences to operations of the change in the competitive advantage paradigm? .............................................................................................................. 62
2.16.4. Are distinctive advantages emergent or intentional? ..................................................... 64
2.16.5. What are the drivers of the evolution of operational abilities? ........................................ 67
2.16.6. Is the systems and structure view enough to understand the evolution of operational abilities? ............................................................................................................. 70
2.17. A PROCESS VIEW OF CAPABILITY CREATION .................................................................. 73
2.18. THE STRATEGIC FRAMEWORK: DYNAMIC CAPABILITIES ........................................ 74
2.19. RESEARCH QUESTION AND SCOPE ............................................................................... 77

CHAPTER 3 – GROUNDED RESEARCH .................................................................................. 80
3.1. SEARCHING FOR A MODEL ................................................................................................ 81
3.2. DEFINING THE MODEL'S ELEMENTS ............................................................................... 82
3.3. GROUNDED RESEARCH AT CIGNA .................................................................................. 86
3.4. INITIAL CONDITIONS ......................................................................................................... 87
3.4.1. The literature perspective of the importance of initial conditions ..................................... 87
3.4.2. The categories of initial conditions .................................................................................. 89
3.4.3. First order initial conditions ............................................................................................ 89
3.4.4. Second order initial conditions ......................................................................................... 91
3.5. ORGANISATIONAL PROCESSES ..................................................................................... 94
3.5.1. Co-ordination .................................................................................................................. 97
3.5.2. Attributes of co-ordination behaviour ............................................................................. 98
3.5.3. Entrepreneurship ............................................................................................................ 99
3.5.4. Attributes of entrepreneurship behaviour ....................................................................... 100
3.5.5. Learning ........................................................................................................................ 101
3.5.6. Attributes of learning behaviour ...................................................................................... 104
3.6. MANAGERIAL PROCESSES .......................................................................................... 106
3.6.1. Gap closing ...................................................................................................................... 109
3.6.2. Management style ......................................................................................................... 110
3.6.3. Senior management teamwork ....................................................................................... 111
3.6.4. Performance control ...................................................................................................... 112
3.6.5. Behaviour alignment ................................................................. 112

3.7. PROCESS CONTROL AND REDESIGN ........................................ 114

3.7.1. Process control and organisational learning ............................. 116

3.7.2. TQM ..................................................................................... 118

3.7.3. Quality gurus ........................................................................ 118

3.7.4. Reengineering ........................................................................ 121

3.7.5. TQM and BPR ....................................................................... 123

3.8. HYPOTHESES .......................................................................... 126

3.8.1. Research outline .................................................................... 126

3.8.2. Exploratory hypotheses ......................................................... 127

CHAPTER 4 – MACRO RESEARCH FRAMEWORK .................................. 135

4.1. INTRODUCTION ......................................................................... 136

4.2. THE ORIGINS OF ADVANTAGE .................................................. 137

4.2.1. The distinction between strategy content and process .......... 137

4.2.2. The challenges in process research ....................................... 139

4.3. A DISTINCTION BETWEEN QUALITATIVE AND QUANTITATIVE RESEARCH METHODS ............... 140

4.4. CHOOSING THE RESEARCH DESIGN .......................................... 142

4.4.1. Implications of unobservables to theory testing .................... 144

4.4.2. Choosing between qualitative and quantitative methods ......... 146

4.4.3. Chain of causality ............................................................... 147

4.4.4. Number of cases ................................................................. 148

4.5. Validity and reliability .............................................................. 150

CHAPTER 5 – THE MICRO RESEARCH FRAMEWORK .......................... 153

5.1. DEFINING THE MICRO-RESEARCH DESIGN .............................. 154

5.2. THE SAMPLE ............................................................................ 155

5.3. DEFINING THE THEORETICAL FRAMEWORK - GROUNDED RESEARCH ........................................ 157

5.4. DATA COLLECTION METHODS ................................................. 159

5.5. QUALITATIVE DATA COLLECTION .............................................. 159

5.5.1. The meaning of process ..................................................... 160

5.5.2. The theory of process ......................................................... 161

5.5.3. Data collection ................................................................. 163

5.6. QUANTITATIVE DATA COLLECTION .......................................... 166

5.6.1. Questionnaire design ......................................................... 166

5.6.2. Scale validity and reliability .............................................. 168

5.7. DATA ANALYSIS ....................................................................... 170

5.7.1. Explanation and causality .................................................... 171
6.4.2. a. Gap closing ................................................................. 217
6.4.2. b. Management style ..................................................... 220
6.4.2. c. Senior management team work ................................. 221
6.4.2. d. Performance control ............................................... 222
6.4.2. e. Behaviour alignment ................................................. 223
6.4.3. PROCESS CONTROL AND REDESIGN ...................... 225
6.4.4 ORGANISATIONAL PROCESSES ............................... 227

CHAPTER 7 – CROSS CASE ANALYSIS ................................... 230

7.1. CROSS CASE ANALYSIS ................................................. 231
7.2. MANAGERIAL CHOICES AND INITIAL CONDITIONS .... 231
7.2.1. Indirect rationality ....................................................... 235
7.2.2. Attentional structures and decision channels ............... 237
7.3. CROSS CASES SIMILARITIES ......................................... 239
7.4. CROSS CASES DIFFERENCES ........................................ 250
7.5. OPEN ISSUES FROM THE LITERATURE REVIEW ............ 253
7.5.1. Does a company necessarily need to implement a manufacturing (operations) strategy to have competitive advantage? ................................................................. 253
7.5.2. Which theory can best describe the evolution of operational performance: Resource-based theory or the manufacturing strategy framework? .................................................... 256
7.5.3. How does the model affect our view of the strategic importance of operations? .............. 259
7.5.4. Are distinctive advantages emergent or intentional? ................................................................. 264
7.5.5. What are the drivers of performance evolution? ................................................................. 266

CHAPTER 8 - CONCLUSION .................................................. 269

8.1. THE MODEL OF OPERATIONAL PERFORMANCE IMPROVEMENT .................................................. 270
8.2. ANALYSIS OF THE RESEARCH HYPOTHESES ............ 271
8.2.1. Hypothesis 1: Strategic operational performance improvement requires the evolution of all initial conditions that hinders the evolutionary process ................................................................. 271
8.2.2. Hypothesis 2: The relevant drivers of strategic operational performance improvement are (a) the organisational processes co-ordination, entrepreneurship, and learning; (b) the managerial processes: gap-closing, management style, senior management teamwork, performance control, and behaviour alignment; and (c) activities related to process control and redesign ................................................................. 277
8.2.3. Hypothesis 3: The drivers of strategic operational improvement are mutually dependent and supportive ........................................................................................................ 278
8.2.4. Hypothesis 4: Very active organisational processes are a necessary condition to achieve strategic operational performance improvement ................................................................. 281
8.2.5. Hypothesis 5: Strategic operational performance improvement results in leaner organisations

8.3 SUMMARY OF THE MAIN EMPIRICAL FINDINGS THAT RUN COUNTER OR ADD TO THE ESTABLISHED THEORY

8.3.1. The process that describes the development of outstanding operational performance is fundamentally different from the MSM

8.3.2. Operational advantage is neither the exclusive product of managerial rationality as implied by the MSM nor emerges without connection with managerial activity as suggested by the RBV

8.3.3. Competitive advantage does not mean literal implementation of the content of strategy

8.3.4. The evolution of operational performance is supportive of a business strategy but not determined by it

8.3.5. Explicit determination of the nature of rents

8.3.6. Strategic trade-offs are necessary when the dimensions require attention to different issues

8.3.7. Central importance of strategic leadership

8.3.8. The importance of initial conditions

8.3.9. Firm level heterogeneity is sustained by isolating mechanisms

8.4 THE PROPOSED MODEL'S MAIN IMPLICATIONS

8.4.1. The evolution of initial conditions is a necessary condition for the development of operational effectiveness as a source of competitive advantage

8.4.2. Managerial and organisational processes and business process control and redesign are the drivers of strategic operational performance improvement

8.4.3. Managerial processes should be mutually reinforcing and consistent with business processes control and redesign in order to favour the development of organisational processes

8.4.4. Organisational processes are the basis of superior operational performance

8.4.5. Organisations that develop outstanding operational effectiveness go necessarily leaner

8.5. SOME ISSUES LEFT UNEXPLORED

8.6. A CRITICAL REVIEW OF THE EMPLOYED METHODOLOGY

BIBLIOGRAPHY

APPENDIX 1. FACTOR ANALYSIS

APPENDIX 2. RELIABILITY ANALYSIS

APPENDIX 3
List of tables:

Table 2.1 – Competitive priorities ................................................................. 24
Table 2.2 – Decision areas ............................................................................ 26
Table 2.3 – RBV x MSM ................................................................................. 61
Table 3.1 - First and second order initial conditions ..................................... 94
Table 3.2 – Quality Gurus ............................................................................. 121
Table 4.1 – Issues involved in research design ............................................. 149
Table 7.1 – Actions by design ..................................................................... 233
Table 8.1 – Behaviour statistics .................................................................. 282

List of figures:

Figure 3.1 – The processes in the organisation ............................................ 83
Figure 3.2 – The strategic process ................................................................. 93
Figure 3.3 – The organisational processes in the organisation .................... 105
Figure 3.4 – The managerial processes in the organisation ......................... 114
Figure 3.5 – Cross sectional model .............................................................. 126
Figure 4.1 Research design decision tree .................................................... 149
Figure 5.1 - Focus and Goals of the research. ............................................. 173
Figure 7.1 – Rationality and the initial conditions of the organisation .......... 234
Figure 7.2 – Intensity of dependency ............................................................ 250
Figure 7.3 – Intensity of organisational processes change ......................... 252
Figure 7.4 - Positioning of our model in relation to the MSM and RBV ........ 257
Figure 8.1 - Histogram of intensity of behaviour sorted by company .......... 282
Figure 8.2 – The process of strategic operational improvement .................. 285
Figure 8.3 – Issues overlapping in services and in manufacturing ............. 293
Figure 8.4 – Kinds of slack ......................................................................... 303
Chapter 1 – Introduction

We introduce this research by placing the discussion within the literature and argue for the need of a new model of strategy in operations. In this chapter we identify the literature that will be review in the next one.
1.1. Introduction

The issue of this thesis is at the heart of corporate strategy. We are concerned with how a firm achieves competitive advantage. We want to understand the dynamics of the process through which an organisation develops its operational performance to become a source of competitive advantage. We also want to know whether this advantage, once achieved, can be sustained.

The management of operations and competitive advantage are related disciplines. The emergence of the manufacturing strategy model represented a break with the Tayloristic paradigm. For almost a hundred years managers had managed the factory with an exclusive inward concern for efficiency. This was changed by the concept of manufacturing strategy. The manufacturing strategy model provided the link between the management of the factory and proactive support of the business strategy of the firm. The factory became more outward looking.

However, the paradigm that dominated strategic thinking until the mid nineties is one that assigns little strategic importance to operations. Manufacturing strategy cannot have the same analytical focus as a theoretical framework that sees competitive advantage as determined by the structure of particular industries. The two disciplines were never able to establish a dialogue because the locus of advantage was found outside the firm’s boundaries. Business strategy decided where to compete and manufacturing strategy then promoted the “strategic fit” of the firm’s productive resources with that strategy. Hayes and Pisano (1995) write:

The [five forces] framework also created a sharper demarcation between the domains of competitive strategy and manufacturing strategy that had existed before. Not only were these two domains separated by problem focus (simplistically: where to compete vs. how to compete there effectively), but also by conceptual approaches. Whereas the roots of Porter’s framework were in industrial organization economics and were based on industry-level studies, the manufacturing strategy framework
A profound uneasiness was created by the successful competitive inroads of Japanese companies into western markets. Their competitive advantage could not be explained by a favourable market structure but instead by outperforming western competitors in operational terms. In a number of other industries similar examples became apparent. Not only was a position of competitive advantage based primarily on operational performance, but inter-firm differences proved surprisingly resilient to imitation. Gittel (1995) reports the unsuccessful attempts by major American carriers to reproduce operational features of Southwest, a relatively small carrier. Challenging the odds posed by a five forces’ model analysis, Southwest thrived on direct competition with its more powerful competitors. Its vigorous expansion and above normal profit margin resulted directly from unmatched operational performance. Southwest’s combination of low costs and quality (in terms of reliability) seemed to resist imitation attempts at least by the larger companies. American, United and Continental launched their copycat versions but, for the most, they were failures which generated large losses.

The RBV\(^1\) was a reaction to the fact that the fundamentals of industrial economics (IO) on which the five forces model was based, could not explain a phenomenon like the one described above. Wernerfelt’s (1984) paper, which inaugurated the RBV, was an attempt to expand the classical theory of business strategy. A number of other works followed, and by the late eighties a sizeable literature was claiming to be an alternative to the IO-based competitive paradigm.

The emerging theory found conceptual grounding in the “Austrian” school of economics (Jacobson, 1992). Schumpeter (1932), in particular, provided the foundation of legitimacy upon which a new theory could be based. Early management writers, such as Penrose (1959) and behavioural economists (Nelson and Winter, 1982), contributed to a definition of the first constructs.

---

\(^1\) Abbreviation for Resource-Based View, that we will be using throughout this thesis.
Manufacturing strategy remained largely untouched by the changes that occurred in the competitive paradigm. Hamel and Prahalad's concept of "core competencies" triggered an increase in academic and practitioners' attention to the new theory. Some authors attempted to add the concept of "competencies" to the existing framework of manufacturing strategy. The resulting framework (Vickery, 1991) attracted little interest. The inability to integrate the new concepts into the management of operations should not come as a surprise. The existing framework cannot be expanded and adapted to accommodate the new concepts. It carries a number of assumptions that were inherited directly from IO and from neo-classical economics. The way forward is perhaps to deconstruct the manufacturing strategy model and reassemble it on new grounds provided by the new competitive paradigm. This is the broader goal of this work.

1.2. Research toward a new model

The model that will result from this research should be coherent with the premises and elements that underpin the RBV. Thus, an important point in this research is the explicit acknowledgement and articulation of the premises and concepts that shape our work and the terminology that we will be using throughout this thesis. The exploratory nature of the research demands continuous refinement of the concepts that we will be attempting to establish. In many cases, the final meaning will deviate significantly from the original one.

The new paradigm of competitive advantage poses questions of competitive interaction but expects operations answers, which the current paradigm of operations strategy cannot provide. To be able to complement the new paradigm of competitive advantage, the notion of strategy in operations must deploy mechanisms to understand how the organisation internally creates elements that allow it to deliver superior operational performance. Corporate strategy, then, should explain how superior operational
performance will affect the competitive interactions between the firm and its environment.

Much of the discussion inspired by the concept of "core competence" has highlighted the importance of technology. There is an intuitive appeal in the link between proprietary learning, technology development and competitive edge. Proprietary technology can deliver differentiated products. Thus, product R&D is the primary source of advantage.

In this thesis the notion of technological-based advantage will be disregarded. Although there may be cases in which technological edge is the most important factor determining the differentiation of products and service, we consider it to be restricted to a specific industry such as pharmaceutical. What is of more interest are industries in which there is no significant technological difference between competitors. These industries are not R&D intensive. Firms have to rely on the production processes, instead of the product itself, to gain an edge. The nature of competition of a pharmaceutical company that depends heavily on the outcome of its R&D is different, for instance, from that of an airline. The products the airlines offer are, from the point of view of technology, undifferentiated, because the technology embedded in planes and information systems is available to all competitors.

We concentrate on the internal organisation of the firm which defines how effectively it produces value for its customers. The first step is to analyse the theories that offer prescriptive advice about how a firm should manage its internal resources. In search of clues to build our model, we evaluate the assumptions, concepts, and constructs offered by the resource-based view and manufacturing strategy. These issues will dominate chapter II which is dedicated to reviewing manufacturing strategy and resources-based literature. A number of unanswered questions will result from the tension generated by the confrontation of both literatures.

After reviewing the literature, it will become clear that we do not have the necessary constructs to implement our research. The resource-based theory, on which we should
base our constructs began very theoretical and has a strong background in economics. Its constructs are ill defined and difficult to recognise in a real organisation. Thus, one of the central challenges of this research is to develop constructs that are at the same time firmly grounded in reality and coherent with RBV's principles.

A process view of the organisation, based on Garvin (1994), was the vehicle that allowed us to operationalise the research. This led us to Teece et al.'s (1994) concept of "dynamic capabilities", which is coherent with the process view, as well as with RBV's principles. We kept in mind that whatever is the vehicle on which we should base our model, it should be able to incorporate a number of important pieces of literature which the manufacturing strategy model was unable to do. Any explanation of how a firm develops its operational performance would be incomplete if it ignored well-established concepts such as learning organisation, TQM, or business re-engineering.

Equipped with this theoretical background we went into the first site. In the tradition of grounded research, we did not have a framework. We asked the managers to tell us their experience with the process of change. A few interviews gave us the overall picture of the strategic process that had occurred.

To define the model, it was necessary to identify those variables whose variation would explain the outcome of the strategic process. Chapter III describes the grounded research phase. The model resulted from the interaction of our first set of data with the literature. The terminology and concepts were increasingly refined throughout the thesis, but here we present the final version. The model provided a more structured picture of the process. Specific pieces of literature were added to define new elements highlighted by the model.

Chapter IV and V define respectively the macro and micro research framework. Chapter VI describes the within case analysis based on data treatment provided by the case studies. The case studies are not reproduced here because of lack of space. Chapter VII presents a cross case analysis of the data. The first conclusions are drawn through a
discussion of the open literature questions from chapter II. Finally, Chapter VIII is dedicated to a discussion, improvement, and consolidation of the proposed model.

1.3. Deconstructing the concept of strategy in operations

From the beginning manufacturing strategy embedded in its fabric many "imported" assumptions. It could not be different. Strategy, as an academic concept, does not belong to the discipline of operations. Hayes and Wheelwright (1994) adopt the classic school of strategy model in which the different strategies within the firm are organised in rigid horizontal and vertical relationships. According to this model, strategies filter down the organisation. The Corporate strategy determines the SBU\(^2\) strategy under which are the functional strategies (e.g., marketing, finance, and operations). This neat separation of the several strategies and their hierarchy is an important implicit assumption.

The concept of strategy in operations was built into the (then) dominant paradigm of strategy. Consequently, it carries all the assumptions built into its parent framework. But business strategy could not find legitimacy within itself. It turned to economics in the search for established concepts. This is why early business writers such as Penrose (1954), who saw the roots of advantage in the internal organisation of the firm, were ignored. Their ideas were not compatible with those of economists who treated the firm as a black box. Economists dismissed the firm as an inscrutable black box and turned to the market for explanations as to why firms appropriate above-normal returns.

The paradigm of competitive strategy summarised by Porter in the five forces’ model is, in broad terms, a translation of the economics discipline known as industrial organisations (IO) into business literature. This model is built upon neo-classical assumptions. These assumptions manifestly shaped manufacturing strategy. We should also add to the economic rooted assumptions those which are particular to the classical school of strategy. Together they represent a straight jacket that prevents the opening of

---

\(^{2}\) Strategic Business Unit
the black box of the firm and the understanding of what affects its ability to compete. Some of the central premises are:

Mobility of resources. Sustainable competitive advantage is not a concern of manufacturing strategy. Indeed such discussion does not make much sense because of the new-classical assumption that firms’ productive resources are mobile or are available to external markets. This conviction is so strong that the big American carriers did not hesitate to set up operations designed to match Southwest’s. They have considered only the general business formula to be strategic. Backed up by a financial capability that dwarfed Southwest’s, these companies acquired the necessary resources from external markets. What they did not realise ex-ante was that they lacked what cannot be bought in perfect markets. In this case, intangible differences determined the competitive outcome.

Rational manager. In the discipline of business strategy the assumption of the unbounded rational manager has been under attack for some time. Revisionist writers such as Pettigrew and Mintzberg (1991) have provided sufficient evidence that this assumption has no correspondence in reality. Nonetheless, the MSM assumes no ambiguities in the process of identifying where the organisation stands (A), where it should go (B), and perhaps more important, how to get from A to B.

However, in most cases, there will be plenty of uncertainty about what A and B are. Besides the ambiguities involved in formulating the strategy, there are those that relate to the process. This point touches the core issue of this thesis. According to Hayes and Wheelwright’s (1984) model, management should choose which attributes of performance it will prioritise. The definition of the strategic gaps guides a number of decisions in each of the decision areas. This ambiguity-free process, in which a number of decisions result in the organisation moving from A to B, is particularly detached from reality. The fact is that managers are faced with enormous ambiguity and have very little understanding of cause-and-effect relationships.
Dichotomy between content and process. Mintzberg (1990) quotes an example that reflects the mindset of most of authors in manufacturing strategy: “the perfectly pre-formed policy idea (...) only requires execution and the only problems it arises are ones of control”. The planner, or the planning team, should be able to set the goals, plans, and control and manage incentives and indoctrination in order to “take care of the human side of the equation”. Above we suggested that managers are not super rational individuals. The internal transformation of the organisation is an extremely complex and ambiguous process. As Mintzberg notes, the organisation may be resilient to change because of a range of factors. In addition, those in charge of implementation may have different interests and interpretations of what causes the process to experience slippage between formulation and implementation.

The firm is not isolated from its environment. The third factor identified by Mintzberg suggests that the external environment may cause unexpected events not foreseen by strategy. Therefore a number of uncertainties inside and outside the firm strongly suggest that process and strategy, formulation and implementation, and thinking and acting cannot be separated. Nevertheless, Vickery et al. (1993) see operational differentiation as the outcome of a better ability to implement.

Organisational members as profit maximisers. This assumption refers to one of the problems highlighted by Mintzberg above. A reason why strategy “drifts” away from planning is the fact that many people in the organisation have power to influence the course of the project but they do not converge. Senior and middle management do not constitute a homogeneous group. Organisational reality may be characterised by vested interests, rivalry, and different perceptions, etc. In empowered organisations, even the workers will have reasonable levels of discretion and power to affect the outcome.

Classic economists ignore the human side of the firm and so does the classical school of strategy and in consequence, manufacturing strategy. A theory of strategy should not limit the human side to a few infrastructural decisions, but instead have it as its central
focus. Sustainable performance differences can only be related to what people do. Any structural differences will be short lived under intense competition.

**No change inertia.** A framework based on neo-classical assumptions will assume that the menu of possible strategic choices is unlimited. A failure to materialise intentions in outcomes is regarded as an implementation failure. Histories told ex-post usually ascribe the failure to several factors, such as lack of commitment of management. Explanations which depart from the traditional frameworks will not consider that the problem may have been that the menu was rather more limited than initially assumed.

History is important. The idea that the organisation’s previous history will somehow limit its future choices is intuitively appealing. From this point of view, it is strange to assume that strategy can be formulated in complete disregard of history. Hayes and Pisano (1995) give examples of how previous decisions can influence the formulation of strategy. They highlight the particular influence of the asset structure of the company. But the influence of history goes beyond this. History is embedded in many other elements of the firm. Nelson and Winter (1982) proposed the enlightening concept of organisational routines and argued that these would incorporate the history of the firm. In conclusion, we can say that theories of strategy cannot ignore the role played by the firm’s history.

**Optimisation of productive resources.** The notion of “strategic fit” is a very strong one. Traditionally, strategy is about achieving a “fit” between the firm’s capabilities and its environment. At this point the notion that inertia does not exist is very important. Because inertia is not considered, the temporal dimension is lost. Strategies can, or at least should, be quickly achieved. This creates the illusion that lean producers do not face any trade off and are able to deliver high performance simultaneously on many performance attributes. Slack (1991) considered that high performance in various attributes may be possible if we consider the process over a long period. According to this perspective, the basic difference between lean production and manufacturing strategy is considerably diluted.
“Strategic fit” is then associated with a perspective that disregards the temporal dimension and suggests the optimisation of the resources that the organisation already possesses or can quickly acquire. In contrast, a perspective based on “strategic stretch” considers that, given the necessary time, the organisation can achieve essential transformation that will allow it to respond to the environment from a new resource platform.

1.4. New directions for research

Here we attempt to develop a theoretical base that is essential to understand how operations can evolve to the point that they are able to influence the competitive position of the firm. We have argued above that we would fail on grounds of conceptual inadequacy if we chose to expand the existing framework in order to accommodate the developments in the paradigm of competitive advantage.

A more developed theoretical body would help us to build and refine concepts necessary to understand the new nature of strategy in operations. This theoretical framework should incorporate much related literature on approach issues, such as:

a) The role of managerial cognition – it should acknowledge the debate between top down and emergent forms of strategy
b) The importance of knowledge and organisational learning – it should be defined what we mean by knowledge and how the learning process relates to the evolution of operational performance
c) The importance of quality frameworks and process redesign – No explanation of performance evolution can ignore the whole of TQM related methods and process redesign
d) The impact of the history of the organisation – We should acknowledge the evolutionary notion that history matters
e) Sustainability of the firm’s idiosyncrasy – We have to consider the mechanisms through which the firm is able to keep its operational advantage.
We should be looking to develop a theory that has practical relevance to the practice of strategy in operations. Although we concentrate our attention on theoretical issues, it would be ideal if practical advice could be derived from the resulting model. It will depend on whether constructs are recognisable or not. Therefore, it is important to use grounded research to set the initial framework on which the rest of the thesis should be based.
Chapter 2 - Literature Review

Two sets of literature form the central issues of this research: (a) how organisations should manage its productive resources to achieve improvement of operational performance, and (b) how (a) can be related to competitive advantage and strategy. To discuss the former issue we consider the manufacturing strategy literature, whilst keeping perspective of the relationship of this theory with the lean production theory. In order to tackle (b) we pin down the most relevant aspects of the RBV literature. The confrontation of both models generates a tension between frequently conflicting explanations. We attempt to capture this tension in a series of questions that should expose the literature gaps. There we consider the central themes that run through this research.

Finally, it is explained why we intend to operationalise the research by adopting a view of the organisation based on processes, and we close the chapter by discussing the research question and scope.
The concept of manufacturing strategy is already thirty years old. Throughout this period, many of the fundamental dogmas of manufacturing management which have influenced and have been influenced by the concept of manufacturing strategy, have undergone radical changes.

Skinner was still a student at Harvard in the late 1940s when he recognised that firms were homogenous neither in their approach to competition nor in the way they organised manufacturing operations. In his 1969 article which is considered to mark the beginning of manufacturing strategy, "Manufacturing - The Missing Link in Corporate Strategy", he challenges the assumption that manufacturing should compete in just one dimension - cost. The framework put forward in that article has underpinned much of the ensuing work in the field. As Voss (1985) argues, successive authors concentrated on "simplifying and explaining the framework rather than expanding [it]". The concept of focus and the need for internal and external consistency was the subject of the second article called "The Focused Factory".

Some empirical evidence has supported the validity of the concept. Tunalv (1992) found empirical support for the idea that companies with explicit manufacturing strategies perform better than those without one. Swamidass and Newell (1987) researched 35 firms and also found a positive correlation between the strategic importance of manufacturing managers and performance.

The basic idea that, by developing competitive criteria that are consistent with the firm's overall competitive strategy the manufacturing function could effectively contribute to the improvement of a firm's performance, remained largely unchanged. However, some of the foundations of manufacturing strategy, such as top down planning and the emphasis on structural decisions, are now being questioned. Changing paradigms in manufacturing management and competitive strategy may give rise to the need for some
reassessment of the basic assumptions of the manufacturing strategy literature. Hayes and Pisano (1995) noted that the new paradigm had opened up a number of questions that had affected developments in the field.

2.2. Breaking with the tayloristic paradigm in manufacturing

Until the early 1980s the old tayloristic paradigm had dominated industrial practices in the USA (Hayes and Pisano, 1985) and, to some extent, in the whole western world. Tayloristic engineers had improved manufacturing systems by breaking down the manufacturing process into elementary parts, improving each part individually, and then assembling them again. According to Skinner (1969) this conventional approach lacked a strategic view of the context in which the business was operating and tended to drive all efforts towards cost reduction, responding to other factors only in a reactive way.

Manufacturing strategy was born as a reaction to the scientific management paradigm that dominated the management of manufacturing. The current framework is still based on the original work of Skinner (1969) and subsequent developments by Hayes and Wheelwright (1984). Some of the principles laid down by Skinner can be summarised as follows:

a) Cost efficiency is not the sole criterion in competition
b) Among competitive criteria trade-offs are necessary because every production system has constraints
c) The firm's strengths and weaknesses should guide trade-offs because there is no ideal way of competing, even among firms operating in the same market and industry
d) Factories focused on narrow product markets geared towards a particular market niche will outperform a conventional plant
e) Manufacturing strategy should be formulated as a top down process, where the manufacturing role is to support a given business strategy. The ensuing research did not deviate significantly from this initial framework.
From the late 1970s, the successful Japanese challengers have represented an even greater challenge to the “Scientific Management” paradigm. Traditional production thinking at the shop floor level assumed that specialists should take all the initiatives and the role of the worker was solely to obey his/her superior's instructions. A number of authors that can be grouped under the TQM banner proposed a whole new way of operating in the shop floor. Instead of narrow tasks and little responsibility for tasks performed upstream and downstream, horizontal structures encourage the worker to have a more holistic view of the processes in the organisation. Consequently this approach fosters cross-functional co-ordination and learning.

An important dogma under the old paradigm was that all processes carried some inherent variation and that quality should be achieved by defect inspection. Another misconception was that superior quality implied superior costs. Crosby (1979) proposed some principles for the quality movement which refuted the old dogmas. They were as follows: First, quality means conformance to specifications. Second, quality is achieved through defect prevention, not correction. Third, the final aim of quality improvement is nothing less than zero defects. Fourth, the cost of quality is the cost of doing something wrong. Crosby claimed that the cost of non-conformance could be as much as 40 percent of the whole operating costs.

The concept of manufacturing strategy transformed the way the factory is managed. Today the management of operations has to consider the contingencies imposed by the business/marketing strategy chosen by the firm. We now examine the current notion of strategy in operations.

2.3. The concept of manufacturing strategy

In his 1969 article on manufacturing strategy Skinner argued that:

A company’s competitive strategy at a given time places particular demand on its manufacturing function, and conversely, the company’s
manufacturing posture and operations should be specifically designed to
fulfil the task demanded by strategic plans.

Following these arguments, many articles and books appeared. Hayes and Wheelwright
(1984) were perhaps the most influential in helping to shape the content and process of
strategy. Their contribution was to link manufacturing strategy and business strategy. To
perform the link manufacturing needs would need some essential capabilities. Hayes and
Wheelwright (1984) created a list of dimensions, called competitive criteria, in which
manufacturing could compete, namely: quality, dependability, cost, and flexibility. Other
authors presented their own list and called the criteria by different names such as critical
success factors or performance objectives. Hayes and Wheelwright (1984) recommended
that the criteria in the list should then be ranked according to a priority trade-off. They
stated:

It is difficult, if not impossible, for a company to try to compete by
offering superior performance along all dimensions (price, quality,
dependability, and flexibility), since it will probably end up second best
in each dimension to some other company that devotes more of its
resources to develop that competitive advantage.

Their advice to firms was to attach clear priorities to each dimension, and then
positioning would be an outcome of this trade-off.

According to Skinner, trade-offs are necessary because, all technology-based systems are
limited by their technology in what they can do and this limitation leads to a necessary
trade-off. This became the core of manufacturing strategy because it captured its essence:
the channelling of available resources to develop those competitive criteria that support
business’ goals more efficiently. In order to upgrade the manufacturing function from a
purely reactive role, it was necessary to pursue a manufacturing task, which generated a
need for focusing manufacturing efforts along determined competitive dimensions.
Ferdows and DeMeyer (1990) wrote:
The fundamental premise of production management is the one of focus. To be successful, a manufacturer has to choose between the capabilities of cost efficiency, quality, dependability, and flexibility, and focus all of its attention and resources on pursuing this capability.

Hayes and Wheelwright’s (1984) basic framework saw business strategy as determining the manufacturing mission which guided the trade-off between manufacturing objectives, which in turn would determine the policies that should be adopted in relation to the decision areas. The company makes strategic choices into structural and infrastructural decision areas in order to implement the manufacturing strategy. Structural decision areas according to Hayes and Wheelwright (ibid.), relate to facilities, technology, vertical integration, and capacity. The infrastructure decision areas concern soft issues such as organisation, quality management, work force policies, and information system architecture. The outcome of manufacturing strategy is therefore a pattern of decisions developed from the eight decision areas. The composite of these decisions determines “the structure and capabilities” of a manufacturing organisation.

Other authors express similar views although acknowledging slight variations. According to Schroeder, Anderson, and Cleveland (1986) manufacturing strategy is a collection of mission, objectives, policies, and distinctive competencies. The mission originates from the business strategy and from the market. It defines what manufacturing should do in order to support business success. Manufacturing objectives are the expected and measurable results. Schroeder, Anderson, and Cleveland (1986) understand distinctive competencies as those which set manufacturing apart from competition. However, they are not able to explain how distinctive competencies relate to manufacturing strategy. Swamidass (1986) considers manufacturing strategy as a concept that:

...involves the development and deployment of manufacturing capabilities in total alignment with the firm’s goals and strategy. When manufacturing strategy is well formulated and implemented it gives competitive advantage to the manufacturer through the best and conscious use of the uniqueness of the manufacturing function such as
Swamidass (1986) sums up the concept of manufacturing strategy as the orientation of the manufacturing function to meet objectives derived from those perceived by the business unit and the corporation.

Hill’s (1985) book on manufacturing strategy provides further variations in relation on the Skinner/Hayes and Wheelwright model. The core idea of Hill is the alignment on the manufacturing process to market needs. Instead of a manufacturing mission aimed at supporting a business strategy and guiding a trade-off among competitive criteria, Hill sees the trade-off exercise as less important because the competitive priorities are determined directly by the market. This process of conversion from market needs to manufacturing dimensions is made through the concept of order winner and order qualifier. This concept originated from the original distinction made between motivating and hygiene factors. The idea is to divide the criteria into two levels of priority according to what the market perceives as being an acceptable performance.

Priority should be given to qualifiers which, according to Hill, are “those criteria which are necessary even to be considered by a customer as a possible supplier”. Once the order qualifiers achieve an adequate level, the focus should be on the order winners that are responsible for giving the company an edge over competitors. The idea is therefore to identify ways in which orders are won, and to do this better than competitors, and not to lose orders by offering products below the minimum acceptable to consumers.

Hill considers his framework to be one that asks “marketing questions and get manufacturing answers”. He argues that it provides a unified terminology that allows for the flow of information at the interface of manufacturing and marketing function. The expected result is a manufacturing process that will support marketing strategy. Infrastructure is also considered and should be aligned with a long-term corporate strategy in a latter phase of development.
There are important conceptual differences from the classic model. Hill's concept has influenced many authors in the UK (Platts and Gregory (1990), Slack (1991)) but has been much less successful in the US. The main conceptual difference is that it breaks with the business strategy/manufacturing mission/objectives trade-off/decision areas policy framework. Instead, it focuses on matching structural decisions (manufacturing process and technology) to market requirements. Only then, infrastructural decisions should be taken, in order to support business strategy.

There are some assumptions in the model that need to be questioned. It assumes that: (a) Customers have accurate information about the products and about how the products meet their preferences and needs. (b) This information comes at no cost. (c) The company can obtain accurate information about customers' judgements along competitive dimensions and about how the customers differentiate between qualifiers and order winners.

Another issue is the lack of importance given to trade-offs. Priorities are set by the market requirements so it is very clear which dimension should concentrate on the improvement efforts. However, it has been suggested by Ferdows and DeMeyer (1990) that, in fact, improvements have to follow a certain sequence. To achieve competitive levels on a certain dimension it may be necessary to achieve certain levels in others first.

It should be said that focusing strategy in matching market needs might only partially capture the concerns of business strategy and lead competitors to pursue the same "best way" of competing.

2.4. The context of manufacturing strategy

There is a clear agreement in the literature that the process of manufacturing strategy should support strategies further up in the hierarchy. The top-down hierarchical model advocated by Skinner (1969, 1985) and Wheelwright (1984) acknowledges three levels of
strategy in a firm: The Corporate level, the business unit level, and the functional level. The manufacturing task defines the role and capabilities that the manufacturing needs to support business strategy. Skinner (1985) writes:

The manufacturing task must be consistent and supportive of the corporation's competitive strategy. The manufacturing structure should be organised to accomplish a sharp focus for that manufacturing task.

Swamidass (1986) also sees manufacturing strategy as a process capable of aligning manufacturing capabilities with the goals and strategies of the firm.

Anderson et al. (1989) question the top down process of strategy asking: “should operations capabilities be adjusted to achieve corporate objectives, or should corporate objectives be confined to what operations are capable of doing?” Although, as we have pointed earlier, there is consensus that the main role of operations is to support corporate objectives, some alternative approaches can be found in the literature.

In the same book where they show operations strategy to be subordinate to business strategy, Hayes and Wheelwright (1984) argue that “manufacturing should take a more proactive role in defining the competitive advantage to be pursued”. They further argue that it should not just caution top management about the potential constraints placed by operations, but that it should also inform them about the capabilities that can be exploited in a way which would make it difficult for competitors to match them. Manufacturing would then be turned into a competitive weapon if it succeeded in interacting with other functions and playing a proactive role. They write:

Unfortunately, companies become preoccupied with marketing aspects of their distinctive competencies and lose sight of the nature of their distinctive competencies in manufacturing. When this happens, the company's strategic thinking tends to be dominated by product, market, and product life cycle considerations.
In the article “Strategic planning: forward in reverse”, Hayes (1985) takes this idea further and argues that in some cases, specially where the environment is hard to forecast, instead of the end determining the means, the opposite might be true. Operations competencies should work as a solid base to formulate market strategies. The issue of effectiveness of the manufacturing function in increasing the competitiveness of the firm, is illustrated by a theoretical four stages model proposed by Hayes and Wheelwright (1984) where the strategic role of manufacturing ranges from non existent to proactive.

In Stage 1, manufacturing is described as “internally neutral”. The main concern at this stage is to minimise the negative impact of manufacturing. Some characteristics of this stage are the reliance on external constancy to solve basic manufacturing problems; extensive control to avoid serious damages from occurring before they are detected; and a reactive flexibility which is always necessary to compensate for wrong processes and facilities. Stage 2 is described as “externally neutral” because the objective is to achieve equivalence in competitors’ manufacturing. This phase is characterised by the adoption of an industry’s “best practices”. The only contribution of manufacturing to competitive advantage at this phase is through accurate timing in capital investment. A possible consequence would be to have the capacity available to meet seasonal fluctuations or unexpected peaks in demand.

Stage 3 is described as “internally supportive” because, at this stage, manufacturing is able to provide support to business strategy. The achievement of this stage accords with the majority of the definitions of manufacturing strategy found in the literature. Strategy is aimed at aligning manufacturing decisions with corporate objectives, co-ordinating the manufacturing efforts with other functions, and also capturing long term developments and trends in the industry that can impact on the firm’s competitive position. Stage 4, described as “externally supportive”, corresponds to the stage where one of the sources of competitive advantage is manufacturing virtuosity. This challenges the idea normally embodied in most definitions of manufacturing strategy. It is not developed in a top-down way in reaction to corporate strategy. Instead, it is the product of an interactive process
between corporate and manufacturing strategies. Manufacturing therefore becomes a source of differentiation and competitive advantage over competitors.

The idea of operations-based competitive advantage leads us to the concept of distinctive competencies. The term was coined in the strategic management field. However the development of the concept, theoretically and empirically, has encountered many difficulties. According to Cleveland et al. (1989) little is known about how distinctive competencies can be developed or changed in order to gain competitive advantage.

2.5. Manufacturing strategy content

The content area of manufacturing strategy consists of two categories: competitive priorities, which can be understood as the objectives of the manufacturing identified to support business and corporate strategies, and the decision areas, seen as the structural and infrastructural elements that make up the manufacturing function.

2.5.1. Competitive priorities

The four competitive priorities proposed by Wheelwright (1984) have been widely adopted with slight modifications by the authors in manufacturing. They are: Quality, dependability, cost, and flexibility. The table below links these authors with the competitive priorities that they consider relevant. As shown earlier, the original research into manufacturing strategy saw trade off among the competitive criteria as a necessary step to identify the most strategically important dimensions, once it was recognised that it was not possible to perform well along many dimensions at the same time. However, two pieces of empirical research suggest that these competitive criteria may not necessarily be in conflict.

The achievements of Japanese “lean manufacturers” are described in the book *The machine that Changed the World* (Womack and Roos, 1990). It is the most influential research which challenges the concept of trade off. The book suggests that lean manufacturers can achieve simultaneous high performance in the following competitive
dimensions: lower costs, higher quality, faster product introduction, and greater flexibility

The other significant empirical research was carried out by De Meyer et al. (1989). Based on an international survey conducted by the Manufacturing Futures Projects, which compared manufacturing companies in the USA, Europe, and Japan, the results suggest that traditional trade-offs are often unnecessary. The writers argue that instead of giving preferences to one criterion at the expense of the others, Japanese manufacturers appeared to build one on top of the other. The implication of this research is that there is a logical sequence to the process of building several capabilities. For instance, reductions in cost could be observed through a focus on improving quality. However, the opposite is not true because adopting a policy of cost reduction does not imply improvements in quality.

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>COMPETITIVE PRIORITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelwright (1984)</td>
<td>Quality, Dependability, Cost, Flexibility</td>
</tr>
<tr>
<td>Fine and Hax (1985)</td>
<td></td>
</tr>
<tr>
<td>Swamidass and Newell (1987)</td>
<td></td>
</tr>
<tr>
<td>Tunalv (1992)</td>
<td></td>
</tr>
<tr>
<td>Skinner (1985)</td>
<td>Cost, Delivery, Quality, Reliability (Service),</td>
</tr>
<tr>
<td></td>
<td>Flexibility of Product, Flexibility of Volume, Investment</td>
</tr>
<tr>
<td>Swamidass (1986)</td>
<td>Flexibility, Delivery, Product Introduction, Quality, Cost</td>
</tr>
<tr>
<td>Leong et al. (1990)</td>
<td>Quality, Delivery, Unit Cost, Flexibility, Innovativeness</td>
</tr>
<tr>
<td>Slack (1991)</td>
<td>Quality, Speed, Cost, Flexibility, Dependability</td>
</tr>
<tr>
<td>New (1992)</td>
<td>Delivery, Quality, Flexibility, Price</td>
</tr>
</tbody>
</table>

Table 2.1 – Competitive priorities
According to De Meyer et al.'s sand cone theory, if a company wants to obtain competitive levels of dependability it first needs to achieve a minimum level of quality. In order to be cost efficient, it has to have the initial two competitive dimensions (quality and dependability) sufficiently developed to support the base of the cone. Next in the progression is flexibility. Finally cost reduction requires a minimum of quality, dependability, and flexibility. Therefore the writers conclude that the Japanese companies consider “quality, dependability, cost, and flexibility as priorities which a firm addresses sequentially over time rather than as alternative points of emphasis”.

Tunalv (1992) also found some causal relationships between certain competitive priority variables. However, New (1992) sees these deterministic relationships in a more sceptical optic. Although he recognises that some of the conventional trade-offs have been altered, he asserts that choices over quality and flexibility must at least be considered in the formulation of strategy. Skinner (1985) agrees: “Trade-offs are just as real as ever but they are alive and dynamic”

2.5.2. Decision areas

The capabilities of the manufacturing function are determined by the policies actually adopted towards decision areas. Hayes and Wheelwright (1984) divide the decision areas into structural and infrastructural issues. Structural issues consist of aggregate capacity, vertical integration, technology, and facility plans. Infrastructural decisions refer to organisation and control.

The great majority of the researchers have adopted the Hayes and Wheelwright framework. Skinner (1985), however, divides the decision areas as fixed assets and infrastructure. Other researchers have developed their own lists but, despite some differences, these do not differ much from the original model.

Early writers such as Hayes and Wheelwright (1984) and Hill (1985) concentrate much of their discussion on the structural decisions. The product-process matrix, developed by Hayes and Wheelwright, helped to visualise a possible mismatch between the process
adopted and the volume of market requirements. The core of Hill’s concept of manufacturing strategy is the choice of the right process according to what is regarded as order winners and qualifiers. Other extensively discussed topics were capacity, the type and location of manufacturing plants, and technological issues.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>structural capacity plant and equipment</td>
<td>capacity</td>
<td>plant and equipment</td>
<td>capacity</td>
</tr>
<tr>
<td>facilities</td>
<td>facilities</td>
<td>facilities</td>
<td>facilities</td>
</tr>
<tr>
<td>vertical integration technology</td>
<td>process and technology</td>
<td>vertical integration span of process</td>
<td></td>
</tr>
<tr>
<td>technology</td>
<td>vertical integration span of process</td>
<td>vertical integration span of process</td>
<td></td>
</tr>
<tr>
<td>workforce</td>
<td>production planning and control</td>
<td>quality</td>
<td>quality</td>
</tr>
<tr>
<td>production planning and control</td>
<td>organisation and management</td>
<td>manufacturing infrastructure</td>
<td>control policies</td>
</tr>
<tr>
<td>organisation</td>
<td>product design/engineering</td>
<td>human resources</td>
<td>human resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>vendor relations</td>
<td>suppliers</td>
</tr>
</tbody>
</table>

**Table 2.2 – Decision areas**

As noted by Hayes and Pisano (1995), Skinner had already highlighted the fundamental role of human resources and “production systems”. This was later found to be correct, with much evidence in the literature confirming that different practices adopted by competing companies, rather than different hardware and production processes, reflected on performance. Hayes et al. (1988) argue that because manufacturing competitiveness is
dynamic so also should infrastructure decisions be dynamic because static systems and policies will fail to reflect competitive needs over time. Mills et al. (1995) note that although there have been studies on the interaction of the decision areas, it is still a new and promising line of research.

2.6. Manufacturing strategy process

Among the process variables considered in manufacturing research to date are those involved in determining strategy, such as order winners, and making trade-offs explicit (Hill, 1985; Wheelwright, 1984), and also those which involve manufacturing strategy implementation and support. Some examples include the role of manufacturing manager, managerial leadership, organisational involvement, resource allocation and reward systems (Anderson, Schroeder and Cleveland, 1991), and accord with higher level strategies (Wheelwright, 1984; Hill, 1985; Tunalv, 1992). Consistency is also important. There are at least three types of consistency: between infrastructure and manufacturing task (Skinner, 1985), between manufacturing strategy and other functional strategy, and between manufacturing strategy and the business environment (Wheelwright, 1984; Hill, 1985).

The process of manufacturing strategy incorporates issues and activities involved in the development and implementation of the strategy. To use a metaphor: content is the universe of ingredients available to the cook, whereas process refers to how the dish (the strategy) is prepared. It involves the selection of the ingredients and the knowledge involved in the actual process of cooking them.

As shown before, it is widely agreed that the process of manufacturing strategy should support higher level strategies. For instance, Swamidass (1986) regards manufacturing strategy as the process of aligning manufacturing capabilities with the goals of the firm. Therefore the process of manufacturing strategy must be considered successful when the

---

3 They quote examples of research on manufacturing process and control systems (Berry and Hill, 1992) and the influence of human resources policies in the implementation of manufacturing control systems (Kinnie and Staughton, 1991).
company reaches the third stage on the Hayes and Wheelwright (1984) scale of the competitive role of manufacturing. But how should the outcome of the manufacturing process be assessed?

Hayes and Wheelwright proposed three dimensions that could be used to assess the outcome of manufacturing strategy, covering internal and external consistency. Manufacturing strategy should (a) be externally supportive by performing well along firm’s competitive factors (b) be internally consistent by presenting consistency between business and other functional strategies and (c) be consistent within the decision areas. Slack (1991) adds the time dimension in assessing the outcomes of the manufacturing strategy process. He argues that it is necessary to achieve credibility and consistency over time. But, in actual terms, the assessment of the process is restricted to the formulation process. No work has been done in assessing the actual implementation of the strategy.

The process of manufacturing strategy is seen by Platts (1993) as having four dimensions: point of entry, participation, procedure and project management. The initial phase, or point of entry, is aimed at making clear the need for a manufacturing strategy, and also at providing a common language, or platform, that generates debate within the group. The importance of this fact is demonstrated by the findings of Swamidass (1986). In his survey of 35 firms, he found different interpretations from manufacturing managers and CEO’s on the concept and practice of manufacturing strategy.

Participation can involve other functions or external actors. Slack (1991) sees marketing and product development as involved in the strategic debate, whereas other authors such as Platts and Gregory (1990) and Fine and Hax (1985) regard the involvement of all functions as something that should be encouraged. Financial and human resources functions are likely to be directly involved in the process of manufacturing strategy. Human resources function can play a central role in the implementation of the strategy. Mills et al. (1995) note that participation can also come from outside the business unit. Corporate specialists and external consultants can adopt the role of facilitator in the debate because they do not generally hold the same assumptions as organisation members and may also have experience in the process.
Procedure is seen by Mills et al. (1995) as consisting of three parts: (1) the identification of gaps between adequate and current performance of manufacturing, (2) the formulation of the action plans to close these gaps, and (3) the implementation of these action plans. The audit stage can be done by comparing the performance of the manufacturing function with the levels of expectations of the market along competitive dimensions. This is how it is done by Hill (1985). Slack (1991) explicitly incorporates the performance of competitors into the framework. We say 'explicitly', because market expectations are correlated with competitors' performance.

Different authors have interpreted the formulation stage in fairly different ways. Hill emphasises that the choices of the manufacturing process which meet the needs of the marketplace best should come first. Only then should infrastructural issues be addressed. Slack's audit framework prioritises the gaps to be closed but the actions taken to close them are assumed to be contingent with the organisation and its competitive environment and should be decided by the organisation's personnel. The literature is very inconclusive on what action should be taken in infrastructural decision categories in order to close the gaps identified in the audit stage.

Mills et al. (1995) suggest that an alternative view of the decision areas proposed by Rhodes (1991) has some advantages over the traditional framework, as it clarifies the actions that should be taken, and helps strategy implementation. This model replaces the manufacturing list of decision areas for nine business processes which encompass various activities and functions.

The implementation part of the procedure overlaps with the project management phase of the manufacturing strategy process. As noted by Hayes and Wheelwright (1984) in operations and Mintzberg (1994) in business strategy, what is actually implemented is not what was agreed to in the action plans. Hayes and Wheelwright (1984) conclude:
It is the pattern of structural and infrastructural decisions that constitutes the “manufacturing strategy” of a business unit. More formally, a manufacturing strategy consists of a sequence of decisions that, over time, enables a business unit to achieve a desired manufacturing structure, infrastructure, and set of specific capabilities.

Skinner and Hayes and Wheelwright have different views over the formulation of strategy. It has a parallel in the business literature with a dichotomy created between the design school and the emergent strategy school, epitomised by the work of Mintzberg. It has a parallel in the implementation process. Taken to an extreme form, the top down planning view adopted by Skinner sees the development of manufacturing capabilities as ultimately programmatic, whereas the bottom up model adopted by Hayes and Wheelwright sees capabilities as emerging through an adaptive process. The planning process mode adopted by Skinner has a long tradition in the business strategy literature, informed by the writings of Ansoff (1965), Ackoff (1979), and Andrews (1971). The design school relies on systematic financial analysis to evaluate alternatives. Decisions should be implemented through a series of systematic steps determined by top management and followed by the lower ranks.

Mills et al. (1995) contend that strategy frameworks are generally limited to the audit stage of the strategic process (Platts and Gregory, 1990; Fine and Hax, 1985; Tunalv, 1992; Slack, 1991). They neglect the formulation and implementation stages, because many (in fact the majority of) authors have adopted the same analytical style inherited from Skinner, who, by its turn, was influenced by the design school.

The contingent view advocated by Mills et al. (1995) suggests that business culture and other conditions must play a fundamental role in the making and implementation of manufacturing strategy. Strategy is then multi-dimensional and strategy formulation and implementation might follow neither Skinner’s top down deterministic style nor the bottom up adaptive way adopted by Hayes and Wheelwright. Instead they may fall somewhere in between.
Mintzberg has identified three alternative modes for the planning school: entrepreneurial, ideological, and grass roots. In the entrepreneurial mode the boss is, in many cases, the head of a small enterprise and his vision opens the way for other members whose role is to obey. In the ideological mode a strong vision tends to give members a sense of identity and guides their behaviour towards the achievement of clearly stated corporate goals. Instead of simply obeying, members are expected to collaborate in the formulation of ideas, in an effort to achieve the strategic intent. In the adaptive mode (the one that best fits Hayes and Wheelwright's view), fully rational planning at the top, which determines the rational steps that should be taken by lower rankings is considered unattainable. Instead, frameworks to guide decisions are built through a process of interactions with the environment. Strategy is then the product of many small steps and it changes over time to adapt to contingencies.

2.7. Manufacturing distinctive competencies

The competitive strategy paradigm developed by Porter (1980, 1985) is the principal reason why the strategic role of operations has not until recently been incorporated in the strategic management debate. Porter sees competitive advantage as coming from the manipulation of market forces, as shown by the five forces model. Within this framework, it is difficult to see how differences (therefore potential advantages) in the production system could radically affect competition. The emergent paradigm of competitive advantage, called 'resource-based theory' argues that superior performance is achieved by means of superior production resources that are particular to the firm and whose transferability, immitability, or substitutability are imperfect. According to Hayes and Pisano (1995) it has blurred the clear line that used to divide business strategy from operations strategy. The new business strategy paradigm together with operations strategy seek answers to the same question: “How to compete?”.

According to Schordeder, Anderson, and Cleveland (1986) distinctive competencies are “what sets manufacturing apart from the competition and thus can be defined in terms of uniqueness”. Distinctive competence gives strength to manufacturing in dealing with the
competition. The authors interviewed managers and found that they did not have any difficulty in identifying what they believed were their company’s distinctive competence. Some of the examples the authors collected were:

a) Being able to do things that others cannot do with consistent quality and delivery
b) An ability to do specials with short turn around high quality assurance
c) Very knowledgeable workforce and manufacturing staff and strong technical support staff
d) Unique ability to be flexible to cope with changes caused by external influences
e) Highly efficient and volume orientated physical plant layout

Swamidass and Newell (1987) see distinctive competence as an outcome of manufacturing strategy content, defined as cost, quality, flexibility, and dependability. They write: “Manufacturing strategy content refers to the distinctive competencies of the manufacturing function in the pursuit of competitive advantage”. In a similar way Cleveland, Schroeder, and Anderson (1989) defined the term production competence as: “preparedness, skill, or capability that enables manufacturers to prosecute a product-market specified business strategy”. Both authors understand competence as the degree of alignment between manufacturing process and strategy.

Cleveland et al. (1989) also argue that competence can be measured and has direct relation to the level of actual performance. According to them, production competence can be measured along nine dimensions which are: adaptive manufacturing, cost-effectiveness of labour, delivery performance, logistics, production economies of scale, process technology, quality of performance, throughput and lead time, and vertical integration.

Vickery (1991) also sees production competence as the degree of alignment of the manufacturing process to business strategy. However, he draws a distinction between production competence and distinctive manufacturing competence which is defined as “those things an organisation does specially well in comparison to its competitors
operating in a similar environment”. Vickery (ibid.) focused on the development and implementation of manufacturing strategy to measure production competence defined as “a snapshot of the performance or effectiveness of manufacturing with respect to its current set of competitive priorities”.

Vickery, Droge, and Markland (1993) deepen this line of research. They develop a broader measure of production competence, still understood as the degree of alignment of manufacturing process (or manufacturing performance) to the strategic goals of business. They draw from the literature in manufacturing, business strategy, organisational theory, and marketing and build a thirty items scale. According to the views of production competence in the operations literature, competence is related to the success of the organisation in achieving in full the third stage of Hayes and Wheelwright (1984)'s framework.

Hayes and Pisano (1995) develop a distinct line of research. They attempt to develop a capabilities based approach to manufacturing strategy. Their work is closely linked to the emergent resource based theory, especially to the dynamic capabilities concept developed by Teece and Pisano (1994). Instead of concentrating on defining and measuring competencies, as the researchers reviewed above have done, they focus on the implications of the new paradigm of competitive advantage for operations strategy.

They contend that the very concept of manufacturing strategy might need to be reassessed. Ten years ago Hayes and Wheelwright (1984) proposed a basic model of manufacturing strategy that was focused on the market. The classic steps encompassed by the framework included the statement of the manufacturing mission that would support the business strategy, trade off among the competitive priorities to select the capabilities that should be developed in order to fulfil the manufacturing mission, followed by decisions over structural and infrastructural issues. Ten years later, the product/market orientated approached changed. Hayes and Pisano (1995) write: “Manufacturing strategy can no longer confine itself to guiding short-term choices between competing priorities like cost, quality, and flexibility”, and further, “...manufacturing strategy is not just about
aligning operations to current competitive priorities but also selecting and creating the operating capabilities a company will need in the future”.

Hayes and Pisano (1995) argue that it was clear from the beginning that a paradigm defined by the concepts of strategic fit and focus was inadequate to explain corporate success and failure. They ask:

If fit and focus are not enough, what other concepts must be added?  
Such additional considerations as the “ability to implement” and “management commitment” have been proposed, but most fall under the umbrella of organisational learning.

The emergence of the capabilities-based approach has altered the very notion of manufacturing strategy in a way that is still not very clear. The manufacturing strategy’s concept of strategic fit, represented by the “right” process and structural and infrastructural decisions supporting the selected competitive priority, is not enough.

Hayes (1985) had already observed that the most successful companies tend to be inward looking in the development of basic manufacturing capabilities, instead of developing capabilities in order to achieve market or financial goals. As changes in the external environment created new opportunities, these companies used the skills basis which they already possessed to develop new and complementary capabilities.

2.8. Implications of the manufacturing strategy literature

The concept of manufacturing strategy has found some empirical support and wide acceptance. However the current paradigm has to adapt to changes in the competitive strategy paradigm and manufacturing management (Hayes and Pisano, 1995). Some basic characteristics define the current paradigm: (a) it is determined by business strategy (b) its implementation follows a top-down approach (c) it is divided into content and process (d) it emphasises structural issues.
Research in manufacturing strategy has largely been concentrated on the content area. There is a need for theory building in this area in order to develop sound constructs about how strategy is formulated and implemented in manufacturing firms. The present research has been largely limited to the audit phase of the manufacturing strategy process. Most of the frameworks in the literature concentrate on assessing the effectiveness of current operations in meeting competitive requirements and defining the manufacturing task (Mills et al., 1995), following a planning model of strategy. Most authors consider that the scope of manufacturing strategy finishes here. Once the content is defined, the relationship among its constructs known, and the audit phase indicating the competitive dimension that should be tackled is finished, the role of manufacturing strategy is complete. Few authors address the next phase in the strategy process - formulation.

Despite many shortfalls, the manufacturing strategy paradigm and its lean production counterpart are established approaches to the evolution of operational performance. The next literature review which focuses on the resource-based theory, offers a different perspective on similar issues.

2.9. Introduction to the resource-based theory

Many authors have contributed and are still contributing to the resource-based theory. Wernerfelt (1984) is considered as the ground breaking work in a series of co-ordinated efforts to build an alternative paradigm of competitive advantage, although it should be noted that some earlier constructs were later incorporated into the framework, such as Lippman and Rumelt's (1982) uncertain imitability.

The initial stage of the resource-based theory is marked by an effort to create a solid conceptual ground in order to (1) refute the current paradigm of business strategy, (2) define what is meant by resources, and finally (3) forge a link between resources and superior performance.
Many of the central concepts of this theory have their roots in economics rather than in managerial reality. In order to affirm itself as a model that could explain competitive advantage it was necessary to prove the old paradigm wrong. Thus, the initial research is based on quantitative studies using large samples to try to prove that competitive advantage is determined by firm specific attributes rather than market structure.

A second phase (Leonard-Barton, 1992; Henderson and Cockburn, 1994; Pisano, 1995) is characterised by qualitative and conceptual works by authors whose aim was to produce a managerial theory based on the resource based theory. This aim was assisted by the fact that the RBV became a catalyst for many parallel research streams that had never coalesced. Business policy, behavioural organisational theory and operations literature are among those research streams that are now allowed to integrate their perspectives in order to create a theory of how organisations can create and deploy resources with the purpose of achieving competitive advantage.

### 2.10. A new strategy perspective and economics

#### 2.10.1. Internal/external dichotomy

One of the initial works in strategic management was Learned, Christensen, Andrews, and Guth (1969)'s *Business Policy: Text and Cases*. According to their framework, competitive advantage was about exploiting opportunities raised in the competitive environment using a firm's strengths while neutralising external threats and avoiding being trapped by internal weaknesses. This dichotomy polarised future investigations into the sources of competitive advantage. One research stream focused on a firm's opportunities and threats, while the other focused on a firm's strengths (Penrose, 1959). Each branch of research had its core grounded on competing economic theories. The environmental approach adopted neo-classical economics and, more specifically, the industrial organisations theory (Bain, 1956). On the other hand, the resource-based theory (which inherited the internal orientation) is not exclusively grounded in any specific IO

---

4 We use RBV, which stands for resource-based view, when referring to resource-based theory because this is the convention in the literature.
theory. Its core ideas find many similarities with the Austrian school (e.g., the importance of entrepreneurship), and with behavioural economics.

2.10.2. The RBV and the several schools of thought in economics

According to Conner (1991), the RBV adopts some aspects of the various IO models, including its rival, Bain-type IO. RBV agrees with the neo-classical theory that the firm is a combiner of inputs, and also with the Chicago view that the firm seeks to maximise its efficiency during production and distribution of the goods. However, she notes that resource-based theory analyses intermediate term events instead of a long-vision suggested by the Chicago view. RBV is also in disagreement with neo-classical’s assumptions of perfect information, resource mobility, and divisibility. Like the Bain-type IO, the resource based theory regards consistent above average returns as possible. However, there is a fundamental distinction. What is crucial is the fact that Bain-type models see persistent above normal profits as resulting from monopoly which must be protected via entry-deterrence. RBV sees such earnings accruing to company as due to “costly-to-copy productive assets.”

2.10.3. The current paradigm

RBV grew out of the need to challenge the environment-biased competitive strategy paradigm. The works by Porter (1980, 1985) stand at the centre of this paradigm. The essence of his work is to identify environmental conditions that allow a firm to achieve high performance. His elegant framework is easy to understand, teach, and use. This partly explains its popularity with managers. Nevertheless, it suggests that competitive advantage is largely determined by industry structure and consequently, the proactive role of management in creating intra-firm competitive advantage is not an important strategic input. Using his “five forces” model it is possible to examine the attributes which characterise industry’s attractiveness where opportunities are greater and threats are minimised. The normative implications of Porter’s Bain-type IO based theory are that a firm should analyse the five forces to assess the profit potential of a certain industry, and then design a strategy that aligns the firm to the environment. Porter (1985) introduced
the concept of a value-chain that related intra-firm activities to external environment.
Nevertheless the role played by managers is still dominated by the importance attached to
the external environment as the driver of corporate strategy.

2.10.4. Distinct assumptions, incompatible models

Two distinct sets of assumptions clearly distinguish the two approaches. First, each
approach has a particular view of how: (a) rents (profits) are created and (b)
heterogeneity is maintained. Environmental models see the creation of rents as a result of
market power and a deliberate restriction of output also called monopoly rents (Peteraf,
1993). The internally focused RBV, sees superior profits resulting from Ricardian rents.

Ricardian rents are closely related to the assumption that firms hold different bundles of
resources (Barney, 1991). This model suggests that due to superior production factors
(resources), that are restricted in nature, some firms are able to obtain superior efficiency
and, therefore, achieve a lower cost position. In contrast, the alternative monopoly model
suggests that heterogeneity may occur between two groups of firms; those that participate
in strategic groups and those that want to, but are prevented by intra-industry mobility
barriers. Firms within these groups restrict their output in order to maximise their profits.

According to Peteraf (1993) monopoly models regard heterogeneity as arising from
spatial competition and product differentiation. Mobility barriers can create heterogeneity
among group of firms, although they cannot create heterogeneity at the firm level.
Therefore, heterogeneity can occur between incumbent firms and potential entrants. The
maximisation of profits is achieved by the conscious restriction of outputs. As noted by
Barney (1986), these models assume that firms inside an industry or strategic group have
no relevant differences regarding the resources they hold or the strategy they pursue.
Another assumption (rooted in the first one) is that, if for some reason heterogeneity
develops it will not last long, because the resources on which difference depends are
highly mobile.
The refutation of these two assumptions and the investigation of the strategic consequences they bring are the very core of the resource-based theory. The resource based theory (Rumelt, 1984; Wernerfelt, 1984) regards the heterogeneity of resources and the immobility of the resources that are at the root of the heterogeneity as at the core of the explanation as to why some firms in the same industry perform differently. According to Peteraf (1993), in order to achieve Ricardian rents it is necessary that superior resources remain limited in supply.

2.11. A resource based view of competition

An aspect of the resource based theory that has achieved considerable sound macrofoundations, is the constructs that explain the reasons for intrinsic firm heterogeneity among firms and its consequences for durable intra-industry profit differences. The fact that most authors focused on this as a crucial issue in building the basis of the theory (Rumelt, 1984; Wernerfelt, 1984; Lippman and Rumelt, 1982; Itami, 1987; Barney, 1986; Dierickx and Cool, 1989; Teece, Pisano, and Schuen, 1990) reflects a theory building effort largely biased towards refuting the dominant environment-oriented paradigm of competitive strategy. Hence, supporting the notion that firms in the same industry keep their heterogeneity is critical.

As mentioned before, much of the antagonism between the two paradigms of competitive advantage relates to their economic foundations, which carry different and generally conflicting assumptions. Both models have their own view of the mechanisms that determine the level of profitability of a firm. Managerial advice depends directly on the view that is adopted.

It is central to both models that the condition of heterogeneity be preserved. It is only possible in the long term if there are mechanisms in place which limit the competition when ex-post advantage is achieved. As put by Peteraf, whatever the reasons for the initial advantage are, explained either by the Ricardian or the Monopoly model,
competition may either enhance the production of the limited resource or weaken the market power of oligopolistics.

2.11.1 Explaining heterogeneity

Once resource-based theory sees heterogeneity in a different way, then it needs new constructs to explain it. It sees two critical factors limiting ex post competition: imperfect imitability, and imperfect substitutability (similar to how substitutability is treated in market power models as one of Porter’s five forces). Barney (1991) sees substitution occurring in two forms. If a firm wants to replicate a strategic resource but is not able to do so, it may be able to substitute it for a similar or a different resource that is able to produce the similar strategic effects. To illustrate this point, Barney notes that charismatic leadership can arguably be substituted by a corporate culture that induces teamwork and commitment to the achievement of higher levels of quality.

If no alternative substitute resource is feasible, then competitive advantage depends on the possibility of replication. If firms do not possess such resources and are unable to obtain them, they are considered to be the source of competitive advantage. Lippman and Rumelt (1982) and Rumelt (1984) argue that a competitive advantage can only be considered sustainable if it remains a advantage after efforts of duplication have ceased. Barney (1994) states:

A firm is said to have a sustained competitive advantage when it is implementing value-creating strategy not simultaneously being implemented by any current and potential competitor and when these other firms are unable to duplicate the benefits of such strategy.

2.11.2. Isolating mechanisms

Rumelt coined the term ‘isolating mechanism’ to describe the phenomenon that protects firms from imitation. Isolating mechanisms are very similar to Caves and Porter’s (1977) mobility barriers. The difference lies in the level of analysis. Mobility barriers isolate groups of homogeneous firms inside heterogeneous industries, whereas isolating
mechanism refers to particular firms. Rumelt (1987) includes producer learning, reputation, buyer search costs, economies of scale, buyer switching costs, which are all very similar to Porter's five forces model. However, several other isolating mechanisms have been identified within the resource-based approach, they are: (a) causal ambiguity (Barney, 1986, Reed and DeFillipi, 1990, Rumelt 1984, Lippman and Rumelt, 1982) (b) uncertain imitability and (c) path dependence.

2.11.3. Causal Ambiguity

Causal ambiguity is said to exist when the causal relationship between the firm's resources and its observed competitive advantage is not fully understood. As Rumelt (1984) explains:

...if the precise reasons for success or failure cannot be determined, even after the event has occurred, there is causal ambiguity and it is impossible to produce an unambiguous list of the factors of production much less measure their marginal contribution.

Barney (1991) and Rumelt (1987) consider causal ambiguity as at the heart of the explanation of variations in a firm's performance. He argues that for these resources to be a source of competitive advantage, both the firm that has the competitive advantage, and its competitors have to confront the same level of causal ambiguity. Otherwise, it is just a matter of time before this knowledge is made available to competitors. Therefore none of the competing firms must be aware of the link between the competitive advantage and the resources if they are to retain the advantage. Barney writes:

...if a firm with a competitive advantage understands the link between the resources it controls and its advantages, then other firms can also learn about that link, acquire the necessary resources (assuming that they are not imperfect imitable for other reasons), and implement the relevant strategies. In such a setting, a firm's competitive advantage is not sustained because they can be duplicated.
Szulanski (1994) suggests four dimensions for causal ambiguity: Tacitness, complexity, robustness, and integrity. Tacitness is the polar opposite to articulation and can be defined at both individual and organisational levels. While articulated knowledge can be communicated in full by the person who possesses that knowledge to another person, tacit knowledge has to be taught through models of performance and supervised imitative learning. Tacitness at organisational level may occur when some members of the organisation possess tacit knowledge or when collective action is co-ordinated through implicit rules.

Complexity, according to Szulanski, is the degree to which a practice is perceived as relatively difficult to understand and adopt. Reed and DiFillipi (1990) and Simon (1962) argue that interaction between the various isolated practices creates more uncertainty than the sum of the individual uncertainty because the nature of that interaction is ignored.

Robustness refers to the insensitivity that an organisational routine exhibits when faced with variations in the environment in which it is operating. Nelson and Winter (1982) argue that organisational routines need to have damage controlling mechanisms to be effective. These mechanisms should be able to select inputs from the environment, modify the inputs to make them suitable, and also monitor their performance and invoke the other two mechanisms. Learning-by-doing is expected to impact positively on robustness because it is likely that basic problems have been sorted out. Galbraith (1990) found that as technology becomes more mature, the relationship men-machine is better understood. Consequently, it is less prone to be affected by external variations.

Integrity, the last of the four dimensions, refers to the extent to which the boundaries of the capability target for transfer are identified. If elements that have interdependence with this capability are not recognised, or cannot be transferred, causal ambiguity in the functioning of the imitated capability is expected to increase.

---

5 In Sulzanick (1994).
2.11.4. Uncertain imitability

Even if a competitor knows what it should imitate, doing so might not be straightforward. Barney (1991) refers to social complexity to explain this phenomena. According to him, interpersonal relations among managers in a firm, a firm’s culture (Barney, 1986b), reputation among suppliers, and customers are examples of resources that are socially complex. Hence causal ambiguity is not just related to the causes, but also to the replication of the cause. Even if a potential imitator were able to pinpoint which resources are a critical determinant of the competitive advantage, it might be very difficult to identify the specific processes required to accumulate such critical resources.

2.11.5. Path dependence

Path dependence is another major hurdle that can prevent imitation. Barney notes that traditional strategists, such as Ansoff (1965) and Learned (1969) had already acknowledged the impact of path dependency on a firm’s long term performance. An innovative feature of the resource-based theory is the provision of a framework that enables a systematic study of the impact of the history of the firm’s decision on its ability to compete in a long term.

The difficulty of transference does not reside only in the fact that resources are strongly tacit and socially complex but also because their development is ‘path dependent’. As Teece and Pisano (1994) explain:

> The notion of path dependencies recognises that history matters (...)
> Thus a firm’s previous investments and its repertoire of routines (its ‘history’) constrains its future behaviour.

Efficient asset accumulation by imitators is limited by three factors expressed by Dierickx and Cool (1989) as:
a) Time compression diseconomies. This refers to the extra cost of acquiring a resource in a shorter period than is necessary for its natural development by the firm which holds such a resource. Such relationships are likely to happen in all functional areas. Marketing may incur extra costs in order to catch up with a first mover who has managed to develop a solid reputation among buyers. Manufacturing may need to spend to develop capabilities such as JIT under time pressure, while these were possibly costless to competitors who managed to develop them organically.

b) Asset mass efficiencies: These argue that the more developed a resource is the easier it is to develop it further. For instance, it is more difficult for a firm that has just entered a certain product category to develop a high rate of product innovation, than, for another who has been manufacturing such products for a long time and has already mastered the technology and production process.

c) Asset interconnectedness: The accumulation of certain assets may depend on complementary assets that may not be available. Even if a group of scientists holds the knowledge for the development of a new drug, the absence of efficient coordinating mechanisms of the appropriate expertise may make it impossible to patent the product before competitors do.

In conclusion, it can be said that heterogeneity is preserved among firms because of the existence isolating mechanisms. These isolating mechanisms are:

a) Barriers to imitation: reputation, buyer's search and switching costs, etc.

b) Causal ambiguity: Tacitness, complexity, robustness, integrity

c) Uncertain imitability: socially complex resources

d) Path dependency: Time compression, asset mass efficiency, asset interconnectedness

2.12. Organisational theory and resource based theory

The Carnegie tradition in organisational theory is a product of the application of behavioural theory to economics. Instead of concentrating on the vertical structure of organisations (the moral-hazard issue), the Carnegie tradition presents an alternative to
agency theory and basically focuses on two phenomena: the process of decision making, and lateral intra-organisational relationships. Concerning the process of decision making, organisational theory is substituted for the old neo-classical assumption that the actors are profit maximisers in search of an optimal solution. According to Cyert and March (1963), the firm is, rather, a coalition of different interests accommodated in a political truce. In this context, actors take decisions that are rationality constrained (Simon, 1945). Therefore, decisions are satisfactory instead of optimal.

2.12.1. The concept of organisational routine

Organisational routine is an important construct for the resource-based theory developed within this tradition. The notion that organisations have a repertoire of organisational routines that evolve by learning was proposed by Nelson and Winter (1982). Their evolutionary perspective shares the foundations of the Carnegie tradition. According to the authors, organisations tend to develop, stabilise and follow routines. Although these routines may change in the long term, they argue that, in the short term they are the carriers of knowledge and experience that an organisation has. Although this concept is older than the initial resource-based works and the notion of path dependency, it acknowledges the fact that history matters. Nelson and Winter (1982) write:

> It's quite inappropriate to conceive behaviour in terms of deliberate choice from a broad menu of alternatives that some external observer may consider to be available opportunities to the organisation. The menu is not broad but narrow and idiosyncratic, it is built into the firm's routines and most of the choosing is accomplished automatically by these routines.

Organisational routine has a privileged role to play in the building of a solid managerial theory because it captures the abstract notion of distinct competence through a concrete and observable phenomenon. Grant (1991) considered that in order to understand the anatomy of a firm’s capabilities, organisational routine is an illuminating concept. More recently, studies that attempt to understand firm’s distinctive capabilities (Henderson and
Cockburn, 1994; Pisano, 1994) have used the concept of organisational routines as a unit of analysis.

**2.13. Applied management and the resource based theory**

The resource-based view is acknowledged in one way or another by every recent author in strategy but its implications for applied management are still very speculative. Grant’s (1991) *Contemporary Strategy Analysis*, for instance, uses the notion of firm’s specific aspects only to give new insights into Porter’s five forces model. Kay’s (1993) *Foundations of Corporate Success* recognises that “...successful strategy is rarely copycat strategy. It is based on doing well what rivals cannot do readily, not what they can do or are already doing”. Nevertheless Kay does not give credit to a conscious building of this advantage inside the firm because it would represent another version of a wish-driven strategy. Because he concludes that firms are unable to build a competitive edge consciously, he advises them to look for business markets and activities that match their current competencies. We find implicit in both views the old assumption that the inward looking building of advantage is not important.

The ‘core competence’ concept - Prahalad and Hamel (1990) is considered by Wernerfelt (1995) as mainly responsible for the diffusion of the resource based view in the managerial world. The building blocks of corporate strategy, they argue, are the ‘core competencies’ of the corporation. Core competencies are defined as the combination of discrete technologies and production skills that support a company’s product line.

Using the example of Honda and Cannon, Prahalad and Hamel (1990) attribute their success to the management and exploitation of proprietary expertise. Cannon’s core competencies in optics, imaging, and microprocessor control, and Honda’s competencies in engine and power trains, allowed both firms to enter and quickly establish leadership in markets that were seemingly unrelated.
Hamel and Prahalad (1994) argue that an important weakness of the environment paradigm is that it is of little help when managers need to plan for the future. They contend that although the current paradigm provides a useful framework to keep track of competitive positions it fails to capture the dynamics of competence building and to provide insights about how leadership should develop a sound point of view into the future.

Indeed, their view of the need for a strategic intent, that challenges employees to achieve "unrealistic" goals, denies the general assumption that resources should have a tight fit with goals. It runs against the environmental paradigm's concept of short run optimisation.

The firm operates in the short run and is contractually encumbered with a variety of fixed facilities...Strategic choices then express the top co-ordinator's attempt to maximise the rents to these fixed factors over the planning horizon. Caves (1984).

Hamel and Prahalad's concept of strategy sees the sources of advantage in the transformation of the industry. Strategy is then concerned with " (a) changing some fundamental ways the rules of engagement in long-stand industry (...), (b) redrawing boundaries between industries, and /or (c) creating entirely new industries." As in the old paradigm, the implications for management are outward oriented, although this time managers should take into consideration that firms are different and this difference may last long enough for them to redraw the competitive environment.

In short, according to Hamel and Prahalad (1994), creating the future has more to do with revolutionising the competitive environment than with creating competencies within company's exclusive difficult-to-replicate organisational routines. Therefore, they contribute little to an understanding of how operational edges develop. Stalk, Evans, and Schuman (1992) note that Prahalad and Hamel's (1990) concept of core competencies is largely restricted to technological and production expertise. Instead, they suggest that
their concept of capabilities as distinctive high performance organisational routines is a more comprehensive one. They argue:

The building blocks of corporate strategy are not product and markets but business processes. Competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to the customer.

This focus on organisational process is shared by Teece and Pisano (1994). They introduced the concept of dynamic capabilities which will be discussed later.

2.13.1 Evidences from the operations literature

The operations literature has no direct connection with the resource-based theory. However it has provided intriguing evidence that the difference in practice adopted in different companies is reflected on its operational performance, which demonstrates that firms are different internally and that these differences are sustainable over time. According to Nanda (1994), research on quality (Garvin, 1988), speed (Stalk, 1990), flexible manufacturing (Jaikumar, 1989), and new product development (Leonard-Barton, 1992) have traced the sources of competitive advantage, directly or indirectly, to capabilities that are embedded in organisational practices. Garvin (1988), found that quality differences were a result of the differences in the organisational routines responsible for gathering and processing information, linking customer experience with customer design, and co-ordinating factories and component suppliers. Although Garvin concluded that a competence such as quality could be supported by different combinations of routines, the best performers present remarkably similar patterns in their approaches. He concludes that the source of advantage can be traced back to particular systems, practices, and behaviours.

Similarly, Henderson and Cockburn (1994) and Leonard-Barton (1992) trace the source of advantage to being firm specific and embedded in the organisation’s routines and systems. Henderson and Cockburn argue that differences in research productivity are
dependent on firm specific search routines that would be difficult to transfer across the organisational boundary. However, Leonard-Barton argues that knowledge which distinguishes and provides a competitive advantage to the firm is embodied along: (a) employee knowledge and skills (b) technical systems, (c) managerial systems and (d) values and norms. Similarly, Bohn (1994) argues that superior knowledge of the production process, which is firm specific, would give the firm a competitive edge over competitors.

2.14. Literature definitions of resources, capabilities, and competencies.

2.14.1. Definitions

Selzenick (1957) coined the term “distinctive competence”. Authors associated with the classical school of business strategy authors such as Andrews (1971), and Hofer and Schendel and Patton (1978) later used the same term when they referred to firm’s strengths. With the recent interest in resource-based theory and the role of intra-firm differences, which is argued to produce competitive advantage, came a profusion of terms that seem to have very little coherence. Competencies, firm’s resources, and organisational capabilities are used rather freely and interchangeably in the literature. Cases of authors referring to the same phenomenon but employing different terms are frequent.

“Distinctive competence” was originally defined by the planning school of strategy. Significant authors include Andrew (1971), and Hofel and Schendel (1980). Andrew defines it as “what [an organisation] can do particularly well” while Hofel and Schendel define it as “the pattern of... resource and skill deployment that will help it achieve its goals and objectives”. Contemporary definitions also suggest that it is some sort of activity that a firm performs better than its competitors. The concept gained importance along with resource-based theory and became the central source of competitive advantage according to a new paradigm.
Resources and capabilities, which are considered scarce and difficult to replicate, represent a competitive advantage, or a distinctive competence. However, initial definitions of resources and capabilities in the RBV were largely intertwined and were similar to those of the design school. Wernerfelt (1984) identified resources as “anything that could be thought as a strength or weakness of a given firm”. Barney (1991) also considered resources as “assets, capabilities, organisational processes, firm attributes, information, knowledge, etc. controlled by the a firm that enable the firm to conceive and implement strategies that improve its efficiency and effectiveness”.

2.14.2. Abstraction and confusion

Nanda (1994) notes that a closer look at the above definitions would reveal the circularity of the concepts. We can infer that by definition distinctive capabilities result from superior resources. These resources are superior because they caused competitive advantage. The definition of resources in terms of what they do (“a distinctive competence is that which yields a competitive advantage”) instead of what they are, made impossible to analyse why they are productive. As an alternative Nanda (1994) suggested that resources should be viewed as inputs to the organisational production function, and recommended that the situations that determine their usefulness should be analysed.

Grant (1991) had already proposed a basic distinction between resources and capabilities. Resources should be understood as inputs into the production process, such as items of capital, skills, and patents. This distinction gives room for improved definitions of capabilities. This was defined by Grant as the result of “teams of resources working together”. This view is shared by Ammit and Schoemaker (1993) who consider capabilities as referring to “a firm’s capacity to deploy resources, usually in combination, using organisational processes, to effect a desired end”.

Nevertheless, there seems to be an enormous difficulty inherent in defining resources in general terms, and an even greater one in linking them to capabilities in a relationship of causality. Barney (1986) and Cremer (1989) have highlighted corporate culture as a strategic resource, but no one has gone further than guessing which capabilities a desirable corporate culture can produce. This is because resources are not normally solely
responsible for a capability, but instead interrelate with others to form a capability. This means that the analysis is likely to be insurmountably ambiguous.

2.14.3. Resources, capabilities, and competencies

Based on the discussion above we can adopt the dominant view that resources are firm specific inputs to the production process (Nanda, 1992). Resources can be tangible or intangible. It is also generally assumed that tangible assets are always purchasable. One of the tenets of the resource-based theory is that it automatically excludes this category of resources from the strategy debate. Dierickx and Cool (1989) suggest that purchasable assets can not be sources of long lived rents, because these assets can be traded in the market. Therefore resources such as technology whose supply can be expanded according to demand cannot be a source of competitive advantage.

However, this analysis is not complete. Indeed there are cases where a resource, although tradable, can still be a source of sustainable competitive advantage when its supply is fixed; in other words, when it cannot be created despite the demand for it. A simple example is British Airways’ ownership of the best slots for business travel in Heathrow airport. It is a source of advantage, but it can also be traded. This category of resources has occurred for historical reasons (e.g. previous monopoly). Thus first mover advantage may be important because those that pre-empt a certain market or industry may be able to acquire a resource at a much lower price than latter entrants or also be protected from competition by regulations (Rumelt, 1984; Wernerfelt 1984), or simply by luck (Barney, 1986).

Leaving aside specific cases where tangible resources can be a source of advantage due to imperfections in factor market, the strategic debate is totally concentrated on intangible assets, initially termed “invisible assets” by Itami (1987). Intangible resources are both within and outside the firm (Nanda, 1992). Those that are outside include consumer trust, brand image, and control of distribution. Referring those within the firm Teece, Pisano, and Schuen (1990) describe them as: “the mechanisms by which firms learn and accumulate new skills and capabilities.” This quote captures the overwhelming trend to
equate intangible assets with “organisational knowledge”. Nanda (1994) defines intangible assets as:

...an organizational intangible resource, which accumulates from organizational learning, a by-product of the production process.

Following the argument of those who believe that the difference in performance between competing firms can be primarily explained by differences in knowledge, Leonard-Barton (1992) defines core-capability as: “the knowledge that distinguishes and provides a competitive advantage”⁶. Prahalad and Hamel (1990) also refer to collective learning in order to explain the origin of core competencies. Barney (1986), Cremer (1989), and Fiol (1991)⁷ equate the pool of knowledge accumulated by the organisation with corporate culture. Hence, it can be concluded that there is a wide consensus that organisational knowledge is the only resource that can effectively determine competitive advantage. It gives strategic importance to organisational learning but considers the accumulation of intangible assets as a black box.

The first authors to write on the subject do not make a distinction between capabilities and their deployment. Grant (1991), for instance, considers organisational resources to be a “capacity for a team of resources to perform a task”. The following authors tend to consider capabilities as something separated from resources. Collis (1994) isolates three categories of organisational capabilities⁸ proposed in the literature:

a. The first category of capabilities refers to an outstanding ability to perform a basic functional activity of the firm (plant layout, distribution logistics, marketing campaigns...)

---

⁶ Note the terminology confusion. Her definition of capability is close to the general understanding of resource, as an input to production process.
⁷ As noted by Nanda
⁸ Note that capabilities can also be understood as competencies.
Amit and Schoemaker (1993) developed in functional areas, e.g., brand management

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stalk et al. (1992)</td>
<td>'set of business processes strategically understood'</td>
</tr>
<tr>
<td>Treacy and Wieseman (1993)</td>
<td>'One of the three value disciplines - operational excellence, customer intimacy, and product leadership'</td>
</tr>
</tbody>
</table>

b. Dynamic improvement is the common theme in the second category.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amit and Schoemaker</td>
<td>'repeated process or product innovations, manufacturing flexibility, responsiveness to market trends, and short development cycles'</td>
</tr>
<tr>
<td>Teece et al. (1994)</td>
<td>dynamic routines that 'govern the ability of an organisation to learn, adapt, change, and renew over time'</td>
</tr>
<tr>
<td>Hayes and Pisano (1994)</td>
<td>enabling a firm to 'switch gears from for example, rapid product development to low cost-relatively quickly and with minimal resources'</td>
</tr>
</tbody>
</table>

c. The third category of capabilities also refers to dynamics improvements and to the more metaphysical strategic insights into the intrinsic value of other resources or to the pre-emption of competitors in the development of novel strategies.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barney (1992)</td>
<td>'Those organisational characteristics that enable an organisation to conceive, choose and implement strategies'</td>
</tr>
<tr>
<td>Henderson and Cockburn (1994)</td>
<td>'The organisation's ability to deploy the firm's resources and to develop new ones'.</td>
</tr>
</tbody>
</table>

The role of management in the development of a capability (understood as the ability to perform a task well) asks for a third construct. Nanda (1994) calls it competence, which he defines as: “Higher order routines which develop and configure organisational resources” (Teece and Pisano, 1994). We should conclude that not only do resources determine capabilities, but competencies also help develop and configure capabilities. By
defining competence in such a way, Nanda allows room for managerial discretion. The ability of an organisation to compete is not just determined by the organisational learning accumulated over time, but also by managerial choice or in other words, strategy.

Teece and Pisano (1994) define as 'dynamic capabilities' what Nanda calls 'competence'. They recognise that strategic management can play a key role in "appropriately adapting, integrating, and reconfiguring internal and external organisational skills, resources, and functional competencies toward changing environment." According to them, the development of firm's specific 'capabilities' (understood as the managerial ability of shaping skill, resources, and functional competencies) and the way in which they renew 'competencies' (understood as performing a task better than competition) are deeply linked to business processes (Nanda's higher order routines), market positions, and expansion paths.

Although there is a degree of confusion and lack of coherence in the literature a general view can be extracted:

a) Resources are inputs in the production process which are firm specific. The strategically important resources are the 'invisible assets'. 'Invisible assets' are understood as the knowledge embedded in the organisation. Organisational knowledge is accumulated over time, through learning-by-doing. There is no room for managerial discretion

b) Capabilities can be regarded as superior operational outcomes that distinguish competing firms (e.g. fast product development, quality, etc.), or the ability to improve those abilities faster than the competitors, or, the ability of management to create an advantage; in other words, a superior ability to transform strategic intents into operational reality. This last category is closer to the general view of competencies in operations which sees advantage as the ability to implement better

c) There is an intermediate construct between the inputs and the outcomes. It refers to the organisational ability of altering capabilities. These are managerial routines responsible for firm's resources deployment and development
Nanda (1994) notes that the resource-based frameworks are able to produce rigorous and robust predictions only when micro foundations of the theory are developed and provide tractable models. Nevertheless, the mechanisms that prevent replication have, by in large, monopolised the conceptual work, while the emergence of competencies has been left practically untouched. He writes:

How intangible assets develop, and what parameters influence this development, are important questions which have received comparatively little attention in the resource-based framework.

2.15. The managerial relevance of the resource based theory

Do we have an economic or a managerial resource-based theory? Contributions to the theory building have been numerous and complementary (Rumelt, 1984; Wernerfelt, 1984; Lippman and Rumelt, 1982; Itami, 1987; Barney 1986; Dierickx and Cool, 1989; Teece, Pisano, and Schuen). Based on these works, frameworks for the application of the theory have been developed by Wernerfelt (1984, 1989), Amit and Schoemaker (1993), Grant (1991), and Stalk, Evans, and Schulman (1992). Prahalad and Hamel's (1990) concept of "core-competencies" was enthusiastically embraced by the business world to an extent that competencies became a major buzzword. As a result, it is now widely accepted that firms are fundamentally idiosyncratic because they develop unique combinations of resources and competencies that may be hard to match. Consequently sustainable heterogeneity at firm level allows firms to earn superior rents than competitors in the same industry or strategic group.

Doz (1994) considers that research on core competencies to date has resulted in an economic theory rather than a managerial theory. He writes:

Research on core competencies has so far been largely externally oriented and driven by theory building and theory refutation. Theory has developed more in reaction to the economics-driven industry and
environment analysis evolution of the business strategy field, and as a follow up on the seminal work of Nelson and Winter (1982).

The attribution of competitive advantage to resource or capabilities loosely defined (generic terms) has not proved to be a viable path towards managerial theory. Nanda (1994) argues that generic factors such as management skills, corporate culture, and organisational systems, cannot be a source of competitive advantage because, whether resources are strategic or not, is defined by their idiosyncrasy and the contingency of the situation.

Some of the key implications of the theory developed so far are:

a) The RBV radically changes the perspective on how competitive advantage is created. The focus is shifted from the analysis of the external environment to the development of internal resources
b) The literatures tend to associate strategic idiosyncrasy to “organisational knowledge”. It therefore gives learning a central role in strategy
c) Although managerial routines have been acknowledged to have a role by current authors who have focused on the ways in which organisations develop particular operational abilities (e.g., Henderson and Cockburn, 1994), the isolating mechanisms pose a number of limitations on managerial choices in creating advantage

Porter (1991) argues that research on strategic operational outcomes can be either focused at (a) separating the causes of superior performance at a given period of time or (b) understanding the dynamic processes that produced that outcome. He then called the former a cross-sectional problem and the latter longitudinal problem and concluded that the position of advantage that is demonstrated by cross-sectional approach has to be explained in terms of two key issues: initial conditions and managerial choice. Schendel (1996) asks: “Which [of the two] is more important in terms of what Porter defines as the longitudinal problem?”
Schendel argues that this is precisely the point where evolutionary ecology comes into the strategic debate about the longitudinal problem. This theory argues that initial conditions are important and may indeed determine the outcome of the strategic process. The resource-based theory is especially relevant when allied to an evolutionary processual view of the development of a firm's abilities.

The path dependency concept broadens the deterministic idea that initial conditions will certainly determine strategic outcomes but reaffirms that these initial conditions do pose limitations on managerial actions. The role of history (and hence time) becomes crucial. Each important decision concerning resources taken by the firm somehow shapes its future alternatives. Nanda (1994) considers that the long-term issue is how to develop an optimal repertoire of competencies, once this repertoire is limited and its alterations are constrained by history. It also suggests that if eventually a firm commits itself to a less than effective repertoire of capabilities it may find itself in a competitive "cul-de-sac" which cannot revert quickly. This was empirically demonstrated by Leonard-Barton (1992).

Doz (1994) draws on the behavioural theory which assumes that organisational routines are the product of a satisfactory compromise (organisational truce) between the company's stockholders. Hence, these routines reflect the relative credibility and power of the various categories of stakeholders. Organisational rigidities then arise because to question practices means to question the people behind those practices and unless the organisation is under clear threat of survival that would eventually provoke a rupture of the organisational truce, which would lead to the alteration of a certain competence development path. This is a major impediment for competencies' renew and the creation of entrepreneurial structures within the firm (Leonard-Barton, 1992). Teece and Pisano conclude:

Thus, firms, at various points in time, make long term, quasi-irreversible commitments to certain domains of competence. To decide, under significant uncertainty about future states of the world, which long term
paths to commit to and when to change paths is the central strategic problem confronting the firm.

The imperfect managerial choice limited by causal ambiguity and uncertain imitability will probably determine the behaviour and knowledge acquired by the organisation at both managerial and shop-floor level. Hayes and Pisano (1995) argue that firms that adopt a "push" system for supplies based on MRP will develop different routines to those that adopt a "pull" system based on JIT. Garvin (1988) notes that the best performing firms in terms of quality which he had studied had chosen to develop particular competencies, and in those particular areas they did notably better than anybody else.

It can be concluded that a firm's specific effects do drive differences in competitive performance (Wernerfelt, 1989; Henderson and Cockburn, 1994). This is because firms have a previous history that is embedded in the organisation's initial conditions which cannot revert very quickly because managers are limited in their cognition (causal ambiguity and uncertain imitability) and because managerial choices are restrained by path dependencies (time-compression, asset mass-efficiency, and asset interconnectedness).

**2.16. Conclusions from literature review**

The discussion of the literature can be organised around the discussion of the five questions below:

2.16.1. Does a company necessarily need to implement a manufacturing (operations) strategy to have a competitive advantage?

For an operational performance to be a source of competitive advantage it has, according to the resource-based theory, to meet three basic conditions: (a) It must be impossible to buy or sell in the available factor markets at less than its true marginal value, (b) it must present difficulties and/or be costly to replicate, and (c) it must be heterogeneously distributed among competitors (Peteraf, 1993).
The objective of manufacturing strategy is to achieve competitive advantage through operations by guiding the organisation of firm’s production processes in a way that affects the competitive position of the firm. The core of Skinner’s (1969) argument is that each company has its particular strengths and weaknesses and strategy should explore this fact through a number of idiosyncratic decisions in key decision areas. In spite of the original idea, the theory that followed Skinner’s inaugural article firmly adopted the notion that the role of the production function was a supportive one. Consequently, differentiation at the production level and replication were not issues for manufacturing strategy. The resulting literature is unable to answer the question above or to explain the evolution of firm specific abilities. Hayes and Pisano (1995) write:

Neither the traditional approach to manufacturing strategy nor its “lean manufacturing” challenger provide much guidance about this new role. Once a company had followed the dictates of manufacturing strategy and configured it to meet the needs of its competitive strategy, there was little operations could do to provide additional differentiation. It could, of course, strive for continuous improvement, but soon as its competitors had similarly aligned their manufacturing structures and infrastructures with their competitive strategies and embarked in comparable improvement programs, everyone would be evenly matched again. Similarly, adopting “lean manufacturing” leaves little room for differentiation: once all competitors have adopted TQC, JIT, and other of its components, how can manufacturing further contribute to a competitive advantage?

So far, the concept of manufacturing strategy has not incorporated notions that address any of the three basic factors that provide competitive advantage. Despite the arguable incompatibilities of the fundamental of manufacturing strategy, there have been attempts to link the idea that firms possess specific features (which have strategic importance) to the framework of manufacturing strategy. The theory developed by Vickery (1991) argues that “competent” companies are those that are more efficient in implementing strategy. For them, the key factor that drives differentiation of the operational function is the ability to implement. Apart from its over simplicity, the major weakness of such a
2.16.2. How incompatible are the resource-based view and the paradigm of manufacturing strategy?

The purpose of manufacturing strategy is to align manufacturing capabilities to market contingencies (e.g. Hill, 1988) or, more indirectly, to link them to a business strategy whose focus is on product-markets (Hayes and Wheelwright, 1984; Slack, 1991). In contrast, the notion that products are only ephemeral manifestations of the firm’s capabilities is a basic tenet of the resource-based theory. Prahalad and Hamel (1990)’s core competence concept explains, for instance, Honda’s clear product superiority in the 1980s mainly as an outcome of its engine expertise. The basic message is that strategic efforts of the organisation should be concentrated on firm’s specific skills and resources instead of product markets. Not only the focus of strategy, but the principles that underlie the literatures, are at odds. When the incompatible issues are put side by side, we can see that the different approaches lead to different perspectives of developing distinctive operational abilities.

The content of strategy and the performance gap framework have been dominating themes in manufacturing strategy’s conceptual and empirical research over the years. Indeed its prescriptive advice concentrates on structural issues such as technology which can be acquired from external markets and does not present any barrier against emulation. Hayes and Pisano (ibid.) argue that strategy as strategic fit between environment and structure cannot explain differences in performance.

...though several airlines may adopt similar competitive strategy, choose the same kind of planes, use the same ground crews at each airport, and adopt very similar passenger reservation systems some turn out to be far more successful than others?
Manufacturing strategy Resource-based theory
Prescriptive advice emphasising structural factors Advantage based on infrastructure "invisible assets"
Replication not considered Replication is a central issue
Capability building Process determined by strategy Capability building Process led by learning-by-doing
Capabilities developed in function of agreed objectives. Focus on content Capabilities development as an emergent process. Focus on process
Top down strategy implementation Adaptive strategy processes
Short run optimisation of resources Long run processes development of resources
Undifferentiated strategic outcome Differentiated strategic outcome
Unlimited managerial cognition Limited managerial cognition and action
Initial conditions are not important Initial conditions are important

Table 2.3 – RBV x MSM

Alternative studies focusing on the process side of strategy are rare. This lack of understanding of the strategic process is partly responsible for the fact that current views of manufacturing strategy do not recognise alternative modes to the top down hierarchical approach, as Skinner originally conceptualised it. This view assumes the principles of the Classical School of business strategy that have long been greatly extended by the works of revisionist authors who focus on the process of strategy. Adaptive views of the strategy process are more appropriate frameworks to understand how firms develop specific abilities (Mills et al., 1995).

Thus the essence of the manufacturing strategy concept is the short run optimisation of the organisational resources in order to achieve the fit between operational capabilities and environmental conditions. It attempts to maximise the rents of fixed factors of production over the planning horizon through the trade off between static alternatives.
At this point, Sanchez and Thomas' (1995) distinction between capability leverage and capability building is a useful one. It highlights the basic distinction between the MSM⁹, based on optimising the existing resources and acquiring resources from external markets (structural decisions), and an alternative framework which sees the evolution of operational performance as dependent on the development of intangible assets. In the first case, a firm's history is not important, whilst, in the second the development of intangible assets would require the alteration of initial conditions. This parallels Sanchez and Thomas' (ibid.) discussion of the difference of a qualitative change in the asset base required by capability building as opposed by a quantitative change demanded by capability leveraging.

Thus there is an important distinction between quantitative and qualitative expansion of the firm assets. The manufacturing strategy refers to quantitative development through the acquisition of resources from external markets while capability building refers to a qualitative change in the firm's asset base. Therefore, while manufacturing strategy does not demand a significant alteration of initial conditions, unless perhaps a quantitative one, capability building demands a qualitative alteration of initial conditions, reaching far beyond the shop floor's practices and policies.

2.16.3. What are the consequences to operations of the change in the competitive advantage paradigm?

The environmental analysis paradigm regards the level of profitability as dependent on a company's power to manipulate market forces. Being outwardly oriented, it is virtually silent about the importance of firm specific abilities. The substitution of this paradigm with the resource-based paradigm creates the context and conceptual ground to argue that differentiation at the operational level can lead to superior financial performance. Hence the management of operations assumes unprecedented importance within corporate strategy.

---

⁹ Manufacturing Strategy Model
The focal question in the previous paradigm of competitive advantage is "where to compete"? Hayes and Pisano (1995) note that for the first time the questions of both operations and business strategy have converged on the same focal point: How to compete? Once both theories have the same key concern, they should share the same conceptual foundations. However a major obstacle is to base practical advice on the resource-based view.

The resource-based theory is a convincing framework to describe competitive success in an ex-post manner. However, unlike Porter's (1985) five forces model, it is not able to produce a robust (within the conceptual foundation of that paradigm) and prescriptive model. Although the resource-based view is not yet able to produce a clear prescriptive framework (perhaps it will never be), it has provided solid concepts which have opened new horizons for the competitive debate. Below we list some of the most significant ones:

a) Different levels of profitability are caused primarily by the firm's internal capabilities which are imperfectly transferable or replicable. The strategic question changes from "Where to compete?" to "How to compete?"

b) Learning, understood as the accumulation of tacit knowledge, is brought to the foreground. The "invisible assets" that sustain a firm's competitive advantage in the market are developed through learning-by-doing. This strongly suggests an emergent character for the process of capability building relegating the intentional aspect to a secondary role.

c) Strategy is given a long-term frame and is restricted. Capabilities take considerable time to develop (time compression diseconomies). The previous history of the organisation conditions the necessary time and ultimately, the ability, to develop a determined capability (path dependence). This concept suggests that the available alternatives to the organisation are restricted. According to Nelson and Winter (1982):

\[\text{The menu is not broad but narrow and idiosyncratic. It is built into the firm's routines and most of the choosing is accomplished automatically by these routines.}\]
d) The distinction between capability leverage and capability building (Sanchez and Thomas, 1995). While competence building implies the expansion of the existing assets through a process of qualitative change, capability leverage represents the expansion of the existing assets through internal development or external markets. Competence building will determine the competitive opportunities available to the firm in the future.

Although the concept of manufacturing strategy has not changed, in order to accommodate the change in the competitive paradigm, Hayes and Pisano (1995) argue that it has the following consequences for the operations function:

a) Elevating the importance of the operations function. Because the emergent competitive strategy paradigm sees competitive advantage as a consequence of doing certain things better than competitors can, the implementation of strategy assumes a dynamic character. We need to understand how structural and infrastructural decisions can create a differentiated operations function.

b) A new role for operations. Hayes and Pisano (1995) write: “The best companies did not stop once they had structured their manufacturing organisations to support their competitive strategies...They challenged (and supported) their manufacturing organisations to become so proficient that they generated new opportunities for the other functional groups.” However, they note that it is not clear how operations strategy should be formulated and implemented in order to create a proactive operations function.

c) A greater emphasis on operations infrastructure. The new perspective clearly sees enduring differentiation of the operations function as possible only when it can be traced back to infrastructure, because competitive edges based on structural factors can be automatically matched by competitors.

2.16.4. Are distinctive advantages emergent or intentional?
The discussion over the intentionality of the evolution of operational abilities has to focus on to which extent the outcome of the strategic process is determined by the strategic intent. In opposition to the manufacturing strategy paradigm the resource-based theory places a central impediment to the notion that management rationality is the only driver of capability building. According to Barney (1991), if the firm that holds the advantage can articulate the mechanisms of this advantage, the knowledge will eventually spread and competitors will also be able to understand the links between resources and performance, and develop or acquire the relevant resources, resulting in loss of advantage. A key proposition of the RBV is that sustainability is directly related to tacitness; in other words, the less articulated an advantage is, the more sustainable and consequently the more valuable it is.

In accordance with this ambiguity principle, authors who share the principles of the resource-based paradigm regard the emerging learning process as the central driver of capability creation. Consequently, the resource-based literature tends to assume little or no connection between the strategy process and the process of capability creation. Pisano (1994) writes:

> If proficiency at a determined activity (such as manufacturing) is critical to competitive advantage, and such proficiency can be improved over time, then learning must play a central role in the competitive advantage of firms. Without learning it is difficult to imagine from where a firm's unique skills and competencies would come.

There is a suggestion that direct managerial intervention may have little to do with the development of operational abilities. According to the associated literature, tacit knowledge is accumulated by the firm through an inward oriented learning process based on experimenting, failing, and using. Nanda (1994), for instance, sees organisational knowledge as a by-product of the production process. Firm specific knowledge is assumed to evolve in a purely emergent fashion without any planning, occurring inside the black box of the learning curve concept, through repeated practice at the individual or small group level. Doz (1994) writes:
Most organisational competencies start with the individual. Individuals have skills and knowledge, benefit from intuition, and can develop expertise. Collective competencies start to develop with individuals and small group learning by doing, rather than with top management engineered grand designs. Competence develops partly as an individual action learning process, through reflective learning between practice and cognition (Schon, 1983). Learning also results from small group interaction involving know-how development and exchange in communities of practice (Lave and Wenger, 1990).

The evocation of the learning curve effect suggests that this is a relevant concept. The historical discussion over the learning curve is of interest here because, for a long time, it was the frame of reference for discussing the evolution of operational abilities, or at least the evolution of productivity.

Alchian (1963) reported an empirically observable phenomenon. Cost reduction could be observed in terms of a linear relationship between the logarithms of direct labour per pound of airframe produced and the cumulative volume produced. The discussions over the causes of the learning effects were polarised. Some attributed it to increasing skills of workers involved in manual operations. Others advocated the influence of redesign of processes, alterations of raw material and end-product quality specifications, more effective maintenance procedures, planning and scheduling, change in production-volume, and incentive pay plans (Conway and Schultz, 1959; and Baloff, 1966).

Although Alchian (1963) provided evidence that the rate of learning differed according to different model-facility combinations, there was a wide spread assumption in the literature that followed that the slope of the experience curve was fixed, fairly constant over time, and constant among all firms in the same industry. Therefore the dominant view implicitly places the rate of improvement outside managerial control in favour of manual dexterity (Dutton and Thomas, 1984).
So is it managerial choice or manual dexterity that drives the evolution of operational abilities? If the learning curve is inconclusive other works such as Garvin (1988) are not, and perceive the differences in the evolution of the quality ability in different companies as the result of different managerial choices. On the other hand what those that studied the learning curve called manual dexterity is closely linked to Doz’s idea of evolution of capabilities at the individual level and its effects cannot be overlooked. Therefore it would be safe to assume that a more reasonable position lies in the middle ground and should assume intentional (grand design) elements as well as emergent ones.

We have to keep in mind that managerial cognition is limited by path-dependence, or the notion that where you can go depends on where you have been. The evolutionary argument taken to an extreme would posit that “current organisational fates can be traced to causes at the time of founding” (Barnett and Burgelman, 1996). In this sense managerial cognition and action would not be relevant to the final outcome of the strategic processes. Put more moderately, the perspective highlights the importance of initial conditions in limiting managerial cognition.

This somewhat conflicting and fragmentary literature begs a number of questions on the evolution of operational abilities. Is the strategic process that leads to superior operational outcomes driven by managerial cognition? Does it emerge from lower levels bearing little connection with managerial actions? Or instead, is it simply determined by initial conditions?

The way towards answering these questions is to identify the drivers of the evolution of operational abilities. Porter (1991) suggested that the drivers that create sustainable advantage are plentiful and varied and somewhat ambiguous. This can be taken as a departure point for this research although it should be emphasized that our question is much smaller in scope than Porter’s discussion of sustainable market positions.

2.16.5. What are the drivers of the evolution of operational abilities?
We concluded above that there are two categories of drivers: one is intentional and related to managerial activity and design and the other is emergent and relate to the actions of workers and line managers of the production function. In order to discuss the intentional category we have to consider the concept of strategy.

Strategy is, by definition, the central determinant of the evolution of operational performance in manufacturing strategy. Operations scholars implicitly adopt the assumptions of Classic School of Business strategy which hold that senior managers, whose rationality is unbounded, formulate strategy as it should be implemented by lower levels of management. A key notion behind it is the idea that the strategic intent is the key (or even the only) driver of capability creation. Thus top managers should be involved in the development and deployment of organisational assets aimed at achieving a goal. Sanchez and Heene (1995) define goals as "...the set of interrelated ‘gap closing’ objectives which motivate a firm’s decision making and give direction to its competence-building and competence-leveraging activities".

The kind of gap-closing action is dependent on the speed of improvement. Operational improvement should be seen along a continuum that ranges from strategic leaps to continual improvement. Strategic leaps are determined by managerial processes alone, where large amounts of funds are required to finance the acquisition of structural elements from external markets and the introduction of technology by external consultants. On the other hand continual improvement does not depend on massive acquisitions from external markets being an inward focused process of capability building. Hayes and Wheelwright (1984) write:

Rather than putting massive resources into developing elaborate plans and projects in the rarefied atmosphere of a remote headquarters building, such a company [that follows a continued incremental improvement approach] expects the bulk of its improvements to bubble up from lower levels in the organisation.
A number of authors have argued for the superiority of the continuous improvement approach. Garvin (1988), for example, reports that no significant technological differences could be observed between high and low performers in manufacturing. Hayes and Pisano (1995) note that the emphasis on infrastructure is consistent with principles of "lean manufacturing". The central concepts of lean production (JIT, TQM, cross-functional integration, and the delegation of problem identification and solving in the shop floor) exclude any hint of hardware driven advantage.

Mills et al. (1995) note that most of the works on manufacturing strategy consider that managerial intervention finishes when the gap-closing areas are identified and actions plans determined. Nevertheless, the outcome of strategy can depart considerably from the strategy as originally formulated by top managers because it has to be continuously modified to accommodate contingencies and conflicting interests, Pettigrew and Whipp (1991) write:

*The importance attributed to linking strategic and operational change is because the process has both an intentional and emergent character. The need is to appreciate how intentions are implemented - and hence transformed overtime.*

This suggests that there are other managerial activities, like negotiating the implementation, that go beyond the formulation of the strategy.

Apart from top management the contribution of other actors in the organisation to the evolution of operational performance is ill defined. Another ill-defined issue is the contribution of lower hierarchical levels to the strategic process. The lean production paradigm recognises the importance of participation at the lower levels of the organisation. It is not limited to contributing directly to change in processes through participation in QCCs. Staff are also directly involved in the change of responsibility roles which leads to total quality management and to the process of team building, necessary for production in cells. Although the lean production paradigm advances in relation to the manufacturing strategy paradigm by demonstrating that lower hierarchical
levels have a significant role, what exactly the nature of their contribution to the evolution of operational abilities is, is still not clear.

Teece and Pisano (1994) argue that high performance routines embedded in the firm’s processes are sources of advantage and are conditioned by the firm’s history. If we think of the processes as business processes in the production function, then lower organisational levels are those that carry high performance routines.

Porter (1991) suggests that the longitudinal problem is about understanding how managerial choices are limited by original conditions, but he should consider not only managerial but also the actions of those in the bottom of the organisation and choices as factors that drive the evolutionary process. Although managerial choices, such as incentives and reporting systems, do have an effect on behaviour at the bottom of the organisation, firm specific routines present in the production function are “invisible assets” whose action can transform the initial conditions of the organisation and allow the evolution of operational abilities.

In conclusion it can be said that the only categories of managerial action recognised by the manufacturing strategy literature are those concerned with identifying and closing performance gaps. Decisions should then be taken in the structural and infrastructural decision areas in order to close the gap(s). As already stated, the literature is very specific and prescriptive on structural decisions, while "soft" infrastructural decisions are more of an art form. There is certainly scope to enlarge the literature in the area of defining what managers actually do during the strategic process and not only during the audit phase.

2.16.6. Is the systems and structure view enough to understand the evolution of operational abilities?

The evolution of operational abilities is assumed in the manufacturing strategy literature to be controlled by management systems and processes. Hayes and Wheelwright (ibid.) acknowledge that the Japanese success in capability building is due to the emphasis of their managerial systems on infrastructure issues. Measurement and control systems,
workforce policies, management selection and development policies, capital budgeting and allocation systems, and organisational structure are some of the main concerns of management. When appropriately refined, the systems elements can:

...provide a firm with a competitive advantage that is difficult for competitors to overcome if they have not developed a similarly effective infrastructure. (Hayes and Wheelwright, 1984).

Hayes and Wheelwright advise firms who want to become stage IV manufacturers not to rely on major breakthroughs, but instead, to improve on the basis of "accumulation of knowledge and relatively small steps". Systematic improvement would be dependent upon the quality of the management of the factory. They refer to the quality of the management of the factory as "internal capabilities". Managers should be able to alter the company's systems and policy in order to create the ability to learn and improve faster than competitors.

If manufacturing competitiveness is dynamic rather than static process, the company infrastructure must be dynamic as well. If its systems and policies become static, over time they will fail to reflect competitive needs. Production control systems, performance evaluation procedures, capital budgeting processes, and project management structures must all be developed with flexibility and improvement in mind. (Hayes and Wheelwright, 1984)

The link between systems and behaviour at the bottom of the organisation is better established in the human resources literature. According to Gittel (1995) cognitive frameworks determine behaviours. Managers can shape behaviour at the bottom hierarchical levels by adopting systems and redesigning the organisation in a way that influences the way in which people think about their jobs. This, in short, alters line managers and employees' cognitive frameworks. Gittel (1996) quotes an emergent set of literature in organisational design suggesting that horizontal co-ordination can be improved by changes in accountability, performance assessment, rewards, conflict resolution and culture. In a similar way, the human resources systems literature suggests
links of cause-and-effect among organisational practices, how employees view their jobs, and operational performance.

Teece and Pisano (1995) argue that one of the strategic dimensions of the firm is its managerial and organisational processes which they define as "the way things are done in the firm, or what might be referred to as its ‘routines’, or patterns of current practice and learning". It has been argued that the lean production paradigm requires different management processes to support change in processes and practices on the shop floor. In other words to change what workers are doing on the shop floor, managers have to alter their own patterns of behaviour. Therefore, the infrastructural decision areas framework of the manufacturing strategy paradigm should at least be enlarged to consider what management actually does instead of focusing only on their systems and policy decisions.

In fact, Rosenbloom and Abernathy (1982) already stressed the importance of understanding management behaviour. They used a two by two matrix, defined in terms of software and hardware in one axis and hardware and software on the other, to show the weaknesses and prescriptions of the western approach to manufacturing, on which they comment:

> In our judgement, the basket most in need of watching today is the cluster of management practices in quadrant IV...issues in the other quadrants are important, to be sure, but we believe that “micro software” - what management does - is essential to the renaissance of a beleaguered American industry

A useful addition is to also understand what people on the shop floor do because this can shed light on the process of how intangible assets develop and what the parameters influencing such development are. Nanda (1994) considers this issue that has received little attention to date.

In order to move forward, we need to formulate a view that includes behaviour at various levels of the organisation. This alternative view has been proposed by Garvin (1994) and
is reviewed together with Teece and Pisano's (1995) concept of dynamic capability which follows the same line as Garvin's (1994) work and provide an integrative strategic framework.

2.17. A process view of capability creation

Organisations have been traditionally regarded in terms of structure and systems. The strategy-structure-systems doctrine is about allocating resources, assigning responsibilities, and assuring their effective management through control (Ghoshal and Bartelett, 1995). Structure involves roles, positions, and levels. Systems are similar to process in the sense they are descriptions of a series of interconnected activities. The essential difference, however, is that systems have, according to Garvin (1994), a more "mechanistic, fixed quality than process...[systems are] less organic and more structured" than processes.

Instead of simply enriching and extending the systems and structure framework, the process approach represents a real alternative. It has been argued (Weick, 1979; Garvin 1994) that processes are the best unit of analysis to investigate the organisational evolution. Garvin (1994) writes:

Some scholars have gone a step further, arguing that a processes perspective is more than a supplement to traditional theories of organisational structure and systems: it is actually the best way to understand and describe organisations. In their view, a process perspective best matches the dynamic, evolving quality of organisations and should be the dominant form of analysis...A process approach encourages thinking in story lines rather than events.

Garvin's distinction between behavioural and managerial processes suggests a way forward in this research by proposing a dynamic middle ground beyond the static distinction between emergent and intentional advantages. Instead of assessing the contribution of static drivers we should juxtapose managerial processes and the processes at the bottom of the organisation. Although both should directly contribute to the process,
managerial processes are also geared towards shaping processes at the bottom of the organisation.

...managers exert influence by using managerial processes. These processes help them shape the behaviour of others in the organisation, keeping them aligned and moving in the desired direction. They are the means to an end: well functioning organisational processes and superior organisational performance. (Garvin, 1994)

This view is a multi-disciplinary one that integrates different streams of research. The novelty and usefulness of this approach is backed by Garvin’s (1994) observation of the literature gap that exists in the integration of some of these different views.

The process view works as a vehicle that integrates distinct views and phenomena such as organisational design and the management of process, learning and structural decision. Beginning with Chandler (1962), a long stream of work has linked strategy and structure. It is closely associated with the contingency view of organisations and the importance of strategic fit. The connection between strategy and processes, however, has remained largely unexamined. Even within the strategic process school, few researchers have tried to associate variations in strategies with variations in organisational processes, and to draw implications for performance (Galbraith and Kazanjian, 1986).

2.18. The strategic framework: dynamic capabilities

The “dynamic capabilities” framework is the appropriate strategic framework to bring together the evidences and arguments that trace the advantage of firms down to their proprietary patterns of behaviour. It lays the conceptual foundations that give consistency to this study. The strategic dimensions of the firm are its organisational and managerial processes (which refer to the way things are done in the firm), position (difficult-to-trade knowledge assets, reputation, and relationships with both customers and suppliers), and paths available to the organisation (opportunities available that are restricted by current and previous positions).
We posit that the competitive advantage of firms stems from dynamic capabilities rooted in high performance routines operating inside the firm, embedded in the firm's processes, and conditioned by its history. (Teece and Pisano, 1994)

The real strategic concern of the firm is "to decide upon and develop difficult-to-imitate processes and paths most likely to support valuable products and services" (Teece and Pisano, 1994). This perspective is clearly distinguished from other resource-based views that see advantage in the accumulation of invisible assets, such as technological expertise (Prahalad and Hamel, 1990).

Notions of path of learning and "improvement trajectory" inform the importance of managing carefully the development of processes and skills, because rigidities can make it difficult or even prevent alterations to the firm's development path. According to Hayes and Pisano (1995), a firm might find it very difficult to put in practice a strategy aimed at achieving low cost production after it has spent a long time pursuing the proficiency in flexibility.

Neo-classical economics assumptions of rational actor theory and immediate organisational response are apparently reinforced by the notion that processes can be mapped and redesigned. Business process reengineering seems to disregard the previous asset stock of the organisation. However, history does matter and the development of behavioural processes provides some insights into the mechanisms of path dependence.

Ingrained organisational processes cannot be dissociated from the actual nature of firm competition. Patterns of behaviour are dependent on the nature of tasks that are performed by the organisation. A firm pursuing a flexibility strategy will have different patterns of action, at both workers and managers level, from others pursuing cost advantage. Communication channels, learning processes, problem-solving approaches, interaction across functional borders are shaped by the needs and contingencies the organisation has to face (Henderson and Clark, 1990). The redirection of this path of
development in a short period of time may not be feasible, as not it only takes time to
develop the supportive organisational processes but also the mechanisms used by top
management to accelerate this development are far from clear. Doz (1994) writes:

To disentangle the integration competencies embedded in these channels,
filters, rules and approaches is not what most firms succeed in doing.
Quite to the contrary, most become prisoners of set patterns, and are not
able to re-aggregate their competencies in a different pattern from that
in which they emerged.

Nelson and Winter (1982) and Teece (1982) have argued that many organisational
routines are tacit in nature. Likewise, Lippmann and Rumelt (1982) argue that sources of
competitive advantage may be so complex that even the firm may not understand them.

Reasons for success may not be understood, and their continued validity
not well assessed. Reasons for success may be missed, or successful
approach may not be replicable. Uncertain imitability prevails, even
within the firm. (Doz, 1994)

Even if the incumbent firm could map its competitor's work processes and implement
them, equivalent performance would not be assured because the firm would need to
develop the necessary behavioural processes that are path dependent. Hayes et al. (1988)
provide the empirical evidence. They report that similar workflows showed varying
performance in product development because of distinctive personal interaction.

The dynamic capability perspective goes beyond simply arguing that advantage lies in
tacit organisational routines. It argues that there is a necessary coherence between the
various processes in the organisation10 and one level cannot be altered without altering
the other. Teece and Pisano (1995) argue that it has been demonstrated by the lean

10 Organisational processes are distinguished from the notions of culture, that is a de facto governance
method that can substitute other more formal systems, and organisational routines, which they consider to
be "a little too amorphous to properly capture the congruence amongst processes and between processes
and incentives that we have in mind".
manufacturing paradigm that distinctive practices and processes on the shop floor require distinctive higher order managerial processes. They argue that the style of organisations may carry the necessary elements to achieve performance. They write:

Recognising the congruencies and complementarities among processes, and between processes and incentives, is critical to the understanding of organisational capabilities.

In conclusion, it can be said that the dynamic capabilities framework offers the appropriate conceptual ground for our investigation of the process of capability building. It provides the tools and basic concepts to argue on the primary locus of advantage, its evolution, and sustainability.

2.19. Research question and scope

The objective of this research is to understand the process through which firms strategically develop their operational performance. By "strategically", we mean that performance improvement should be so significant that it may be a potential source of differentiation and competitive advantage for the organisation. The dynamic process that results in the improvement of performance should be explained in terms of initial conditions and managerial choice (Porter, 1991). The research question focuses on this dichotomy. We adapt the question proposed by Schendel (1996) and define the research question as:

Are initial conditions or managerial choices more important in explaining the longitudinal problem?

The question captures the tension between intentionality of managerial actions and unintentional outcomes generated by history and random choices. We may also need to investigate if other members at the bottom of the organisation can contribute in an independent fashion to change the initial conditions. The first step, however, is to define what the initial conditions of the organisation are.
Change induced by management can follow a path of continuous improvement or discontinuous leaps, or a combination of the two. Continuous improvement suggests that we will need to investigate the relationship between senior management and lower hierarchical levels. Discontinuous leaps of performance suggest the application of best practices such as business process reengineering.

Empirically the issue is to initially use grounded research in our first site in order to determine the variables that mediate between the initial characteristics of the organisation and its strategic intent. We then test exploratory hypotheses based on the grounded model which are aimed at clarifying the nature of the various variables and their mutual relationships. The final goal of the research is to produce a model that can explain in longitudinal terms how operational performance improves.

The remaining chapters of this thesis are organised as follows:

A) In chapter three we follow the tradition of the grounded research theory and use data from our first field work to define the model and its elements. We draw on the relevant literature to refine the constructs. Exploratory hypotheses are proposed in order to explore the issues that were found relevant during the initial stages of the research.

B) Chapters four and five define respectively the macro and micro research designs.

C) Chapter six describes the findings from the four case studies, one for each company sampled.

D) Chapter seven discusses field research observation in terms of cross case analysis and addresses the literature gaps (2.16.). It is an opportunity to link field observations with the literature.
E) Finally, the last chapter is dedicated to the consolidation of the proposed model. We discuss the model by testing the research hypotheses and discussing their implications. We then conclude by listing the issues that contain contributions from this thesis to established theory.

\[ \text{see p.20} \]
Chapter 3 – Grounded Research

This chapter complements the literature review. In the tradition of grounded research we mix preliminary field observations of one research site and the literature from the previous chapter in order to propose a model that describes the process of operational performance improvement. Each element of the model is discussed individually. We also add a general literature review of process control and redesign. The reason why this literature was not included in the first chapter is because its importance became evident only when the grounded model took shape.

Finally, we formulate the exploratory hypotheses that will guide the development of the next chapters.
3.1. Searching for a model

This research cannot follow a research line that already exists in the literature. The RBV discusses the fundamentals of competition. It lacks constructs grounded on organisational reality. In contrast, the MSM model refers directly to the management of the firm's productive resources but is permeated by assumptions that are incompatible with the RBV.

Although many of the assumptions of the MSM are irreconcilable not only with the RBV principles but also with the reality of organisations, it still represents a sound theory. We cannot afford to abandon it altogether if our objective is to explain the evolution of the firm's operational performance. As mentioned in the previous chapter, the MSM should be deconstructed and its parts evaluated and reassembled within the principles laid down by the RBV.

The MSM, the classical school of strategy, and the Tayloristic paradigm have a common element. They are divorced from the complexities and ambiguities involved in managing human organisations which operate in uncertain environments. Our option for a process view of the organisation is an attempt to break with these oversimplifications. Jaikumar and Bohn (1992) isolate the central characteristics of the Tayloristic paradigm which are misleading. We should be careful to avoid any of the following assumptions:

a) Production technology is known: The design of the production methods defines the optimal way of production and consists of selecting from known production techniques. The necessary knowledge is transferred from manuals or instructors to line employees.

b) Labour's role is solely to perform procedures: Management specifies and control the execution of procedures that employees should follow in which all contingencies are anticipated and the appropriate response specified.
c) Environment is known and static: In cases where the environment is not static, probability distribution that describes it is known.

d) Homogeneous inputs: Inputs are assumed to be available in perfect markets and to be homogeneous.

e) The goal is known: The goal is profit maximisation, or occasionally a sub goal such as maximising output, and all actors in the organisation are pursuing this goal.

3.2. Defining the model's elements

In an ideal world there are no constraints on what managers can do. The previous history of the organisation and the contingencies it creates are of no importance. The evolution of performance is not significantly dependent on time, as the strategic problem is about putting together the necessary resources that can be readily acquired from perfect markets. If things do not go quite as planned then those in charge of acting, not thinking, are to blame.

Our research question reflects Porter's (1991) consideration that the outcome of the strategic process is determined by the interaction between initial conditions and managerial actions. The use of the word 'action' by Porter seems to suggest managerial decisions and thus the exercise of rationality. By reducing to managerial actions the elements that will modify the initial conditions, Porter is excluding the majority of the members of the organisation. According to this formulation they have no input in the strategic process.

We consider that it is the behaviour of the members of the organisation which will help overcome the resistance offered by the initial conditions. We divide the organisation into management and other members because the nature of their behaviour is different. Nonetheless the behaviour of the lower levels of the organisation is a central factor in
explaining the outcome of the strategic process. We can now lay out broad definitions of the three categories that comprise the model:

The initial conditions of the organisation. Any dimension that can be used to describe the organisation is a possible category of initial conditions. Organisations are commonly described in terms of their organisational structure and systems. They constitute the most obvious categories of initial conditions. Structure refers to the positions and roles occupied by the members of the organisation. System refers to the systems of reward, control, and information.

The alternative process view of the organisation suggests other dimensions. The processes can be divided into business and interpersonal processes. The business processes are the tangible production processes of the organisation. They carry inertia because they determine the tasks and the sequence in which these tasks are executed. Managers and line employees' interpersonal processes are called respectively managerial and organisational processes. So, whereas these processes are the elements of transformation they also carry an inherent inertia.

At managerial level, processes should reflect organisational barriers to change such as: work group inertia, threats to existing balance of power, and previously unsuccessful change efforts (Greenberg and Baron, 1995). At the production level, processes should
reflect the behaviour of line employees which influences the effectiveness of the production processes.

Jaikumar and Bohn (1992) quoted above, highlight the fact that production technology cannot be assumed as given and available. The organisation has to develop a body of "knowledge" of its production processes that is only possible through practice. Although these authors do not make the link between the development of production knowledge and the development of specific attributes of performance, such as quality or flexibility, it is appropriate for us to consider knowledge as one dimension of organisational inertia. The assumption we make is that it may be necessary to improve the organisations understanding about cause-and-effect relationships in its production processes to achieve high levels of operational performance.

What managers do - Managerial processes. The MSM sees a principal role for managers as the definition of gap closing objectives. During the formulation process managers define the operational gaps that should be prioritised and the action plans. Can we then consider that, once the formulation phase is concluded, what management actually does has no effect on the outcome of the strategic process? The answer is definitely no.

What managers do is unimportant only if we assume unbounded rationality. By doing so we are detaching thinking from acting. Once thinking is finished, other members in the organisation are assigned to implement the content of strategy. Deming (1982) has already made a strong argument against the assumption that managers are perfectly rational actors who have all the necessary information and the capability to process it. He states that 85 percent or more of the problems in a typical factory are management-dependent and not worker-dependent. Garvin (1994) suggests dividing what managers do into three broad categories: taking decisions, building support to implement the decisions,
and monitoring performance. These three categories will guide our efforts to define specific categories of managerial processes.

**What workers do - Organisational processes.** Literature which originated from Japanese production methods, such as TQM and lean production has moved away from the Tayloristic idea that only managers are supposed to think. Now, employees are motivated to voice their ideas and to organise themselves into QCCs to tackle production problems. The notion that the organisation should evolve gradually, instead of having performance leaps, has become generally accepted.

Continuous improvement means that workers have a major role to play. Hayes and Wheelwright (1984) advise firms to commit to continuous improvement. Stage four can be achieved only through the accumulation of manufacturing knowledge in small changes. The effectiveness of this policy would depend on the firm’s “internal capabilities” which refer to the quality of management. This emphasis on continuous improvement sounds contradictory with the MSM, where management takes a number of decisions, in several areas, in order to implement a specific strategy. We can conclude that Hayes and Wheelwright saw the MSM as an effective means of moving from stage one to stage three, which means that by following the MSM the company would not be able to achieve stage four.

But can we consider the role of workers to be strategic? According to the current view the role of workers is important but is not strategic. To be strategic means to be able to become differentiated from competitors. Continuous improvement means the involvement of line workers with the identification and solution of problems that affect the outcome of production processes. It is heavily dependent on the methods of process control adopted by the organisation.

We consider that what workers do can create differentiation. But our perspective goes much beyond activities of process control. Strategic importance is located in the interpersonal processes that occur at the bottom of the organisation. These are called
organisational processes. These processes influence the effectiveness of the business processes.

3.3. Grounded research at CIGNA

Grounded research at CIGNA is necessary because of the novelty of the approach chosen here. From the literature, we have broadly defined what are the main elements of our model. Grounded research is necessary for three main reasons: (a) to check the relevance of the constructs to a real setting, (b) to certify whether or not we have included all relevant elements in our model, and (c) to define and operationalise the constructs.

CIGNA Health Care UK is part of CIGNA Corporation, a multi-billion pound company. CIGNA health care operates in the segment of private health insurance. We chose CIGNA because there was available literature from which we could form a picture of the turnaround process before visiting the site. In addition, it was a relatively small and self-contained site (approximately 250 employees) which made it easier for those involved to articulate their experiences.

After reviewing the literature we were aware of most of the elements in the model but had not a clear idea of how they fitted together and their exact meaning and categories. Managers and workers were asked to describe the turnaround process. Through the interview we could further explore any point brought up by the interviewee which was of any particular interest to us.

To determine the sub-dimensions of each category of organisational behaviour we selected these from the literature and then asked workers whether these sub-dimensions had any relevance in their routine work. The same was also true of managerial behaviour. Through the interviews, we were able to define its main dimensions and refine their meaning. Nevertheless, the process of refinement went on long after the grounded research. For instance, initially we though that leadership would be best understood under the managerial process which we called "management style". Later we found that it
belonged under another management process called "behaviour alignment". The grounded research is further described under heading 5.3.

A very important consequence of the grounded research was the inclusion of another element of transformation. We found that the management of the firm's business process could not be considered as a part of either managerial or organisational processes. It represented a category on its own. There are two kinds of interference with business processes: process control and process redesign. In CIGNA, process redesign was very significant and played an important part in the transformation of the organisation. Because it has not been covered by the literature review, we add to this chapter the discussion of the important issues that relate to process control and process redesign.

Under the next headings we discuss the three categories and define the constructs that we will be using to conduct the field studies.

3.4. Initial conditions

3.4.1. The literature perspective of the importance of initial conditions

How corrigible are organisations (Barnett and Burgelman)? The evolutionary argument posits that current and future states of the organisation can be traced back to its foundations. On the other hand, neo-classical principles built in the design school and the MSM, see the menu of alternatives available to managers as unlimited. A middle ground view is one that recognises the role of initial conditions, but sees adaptive forces acting to change them.

Barnett and Burgelman (1996) contend that although initial conditions continue to have consequences for the evolution of the organisation, organisations also learn and act to change those initial conditions that are hindering their evolution. They say that one useful contribution of the evolutionary perspective is to identify constraints on managerial action. These constraints can come from outside organisations, as it is the case with
industry structure, laws, or consumer preferences. But they can also arise inside the organisation being a result of its history. They conclude:

Those who take an evolutionary perspective on strategy explicitly question how strategic outcomes develop, and in doing so treat assumptions of historical efficiency as part of the research agenda.

Although the debate between historical efficiency and adaptive evolution has been going on for sometime, there is a shortage of longitudinal empirical works that can assess the effects of both perspectives. Doz’s (1996) work is the only one to date that has explicitly addressed the role of initial conditions in the evolution of the organisation’s abilities. He focuses on cases of strategic alliances and sets out to identify the dimensions of initial conditions which hinder or foster the outcomes of such alliances. He considers that the study of the evolution of co-operation in strategic alliances contributes to clarifying wider issues of teleological strategy implementation vs. evolutionary strategic adaptation. This could possibly lead to a reconciliation of both views replacing the current somewhat simplistic debate. He expected and found strong inertial and adaptive forces in action in the evolution of strategic alliances.

An important contribution of Doz’s (ibid.) work, as noted by Barnett and Burgelman (1996), is to highlight the role of managers who should recognise inertial forces, and explicitly act upon instead of simply ignoring them. They found that the process was neither teleological nor emergent. Initial conditions influenced the process by being either of a static type and blocking learning and adaptation, or of a generative type and fostering learning and adaptation. In this way, alliances were not completely determined by the implementation of initial designs towards set objectives, because their evolution was not free from the effects of initial conditions.

Porter (1991) sees the strategic process as a dialectic process between managerial choices and initial conditions. Nevertheless, no piece of literature approaches directly the issue of identifying what are the initial conditions that hamper the process of evolution of operational performance. The initial conditions are considered here as the organisational
characteristics possessed by the organisation at the moment prior to the start of the strategic process. But what are these characteristics? Below we ground different works in the literature supporting our field observations to propose the relevant dimensions that represent the initial conditions.

3.4.2. The categories of initial conditions

We entered the field with a good idea of what were the dimensions of the initial conditions. As explained herein, we considered the relevant initial conditions categories to be the basic dimensions of the organisation (structure, systems and processes) and of production knowledge.

During the grounded research we found that the division between those initial conditions that directly affect operational output and those that affect it indirectly would help focus the research. We suggest that initial conditions should be considered in terms of first and second order. Business processes, knowledge of the production processes, and behavioural processes are first order factors because leaner business processes, higher knowledge, and more intense organisational processes are directly related to higher operational performance. When the state of these variables is altered, it has an immediate consequence on operational performance. By developing these elements, the organisation will be able to improve performance along one or more performance attributes such as cost efficiency, quality, and flexibility.

3.4.3. First order initial conditions

Performance improvement demands the evolution of inefficient business processes. Reengineering is based on the idea that sometimes business processes are too inefficient because they have grown without planning and should be scrapped altogether. In an ideal reengineering case, the business processes of the organisation are mapped, designed from scratch, and implemented as planned. If such a mechanist view of the organisation corresponded to reality there would be no point in considering business processes as a relevant initial condition.
Although the change processes in CIGNA were defined in the popular press as a case of business processes reengineering, we found that although the business processes were radically changed they were not re-designed. CIGNA substituted large functions for production in teams. Instead of designing the business processes, managers allowed them to emerge in the pilot teams. The literature has shown that the application of reengineering is far more limited than once believed (Maull et al., 1995).

Knowledge of the production process is also an important initial condition. Bohn (1994) linked the evolution of process knowledge with the evolution of performance. The accumulation of production knowledge is dependent on the process control method adopted by the firm. The six-sigma paradigm is unable to develop knowledge of what accounts for the production processes as a whole. An alternative process control that collects information from several points of the process, can contribute to the evolution of process knowledge (Mukherjee, 1992). We did not find this to be relevant to CIGNA. But we have retained this dimension in the expectation that it may be relevant in other cases.

Shop floor behaviour is an important inertial factor. The literature often refers to the concept of organisational culture to explain the behaviour of workers. Greenber and Baron (1995) note that the view expressed by Peter and Waterman, in In Search of Excellence, was that the most effective companies were characterised by cultural characteristics such as employee involvement and predisposition towards action. But culture is a cognitive framework\textsuperscript{12}. We should be more specific.

What impacts the performance of business processes is not the cognitive framework shared by workers but what they routinely do. The importance of workers' behaviour cannot be underestimated. Organisational processes are arguably the most important factor in explaining differences in operational performance between companies and explaining why similar business processes can deliver different performances (Clark and

\textsuperscript{12} Greenber and Baron (1995) define organisational culture as "a cognitive framework consisting of attitudes, values, behavioural norms, and expectations shared by organisational members".
Fujimoto, 1991). A central challenge to this research is the identification of categories of organisational behaviour and its sub-dimensions. We observed in CIGNA that behaviour had changed. We identified a number of behaviour patterns (such as, "Do people help you when you need?") and asked people whether or not they perceived this particular behaviour to have changed.

3.4.4. Second order initial conditions

Second order factors are those which have a transformational effect on first order factors and thus indirectly affect operational performance. Unlike first order factors, the alteration of these variables will not have an immediate effect on the dependent variables of performance. Second order factors clearly have the effect of transforming first order factors, but cause-and-effect relationships between change in second order factors and operational performance, cannot be easily determined.

Since Chandler (1962), the internal focus of strategy is to change structure. Revisionist writers, such as Mintzberg (1990), challenged Chandler’s notion that “structure follows strategy” and preferred to see structure and strategy evolving slowly and supporting each other. Thus, independent of their view of the strategic process, authors see structure as an essential initial condition that has to evolve. CIGNA promoted a complete review of its organisational structure. It changed from a "tall" structure organised in functions, to a "flat" one organised in a matrix form. There was resistance of several kinds. For instance, senior managers who were responsible for large departments saw that they would lose political power in the process. Both senior and middle managers had problems in adapting to their new roles.

The importance of management systems is generally underestimated. The MSM, for instance, only reluctantly acknowledges that the firm has to adapt its management systems to its strategy. Managerial processes are closely linked with managerial systems. For instance, when managers change the way they control the performance of the organisation, it is likely that new information systems will be necessary. That is what happened in CIGNA.
Kaufman (1992) links the failure of operational improvement strategies to the inertia of inadequate managerial systems. He argues that operations improvement programmes fail because managers do not recognise that these change programmes will require shifts in management practices and in the companies' structure and systems. He writes:

> Upon recognizing these inconsistencies, managers are struck with how unwittingly they have obstructed their own efforts. This is understandable: not only are ineffective management practices deeply ingrained, but also senior management typically does not get a great deal of candid feedback.

From the beginning, CIGNA recognised the importance of using reward systems. It rewarded teamwork to encourage the consolidation of the teams. The MD of Bonas Machine\textsuperscript{13} a successful turnaround story, reported that he wished he could have appreciated the importance of changing people's minds from the start and implemented the adequate HR systems. He says:

> A lot stems from that. It was the stimulus to set up our HR function and has directed many of the improvements since 1992. It sound simple but changing people's mindsets did in fact require a considerable amount of hard work and took 18 months of effort before we could see positive results being achieved.

Managers that do not see the need to alter their managerial systems are even less likely to consider a change in their own behaviour. Management behaviour is likely to be a major impediment to the processes of operational performance. Managerial processes are both an initial condition and a modifying agent.

\textsuperscript{13} The quotation comes from a case study on Bonas Machines performed in connection with the Best Factory Award and obtained from their web site. www.bestfactories.co.uk
The grounded research confirmed the relevance of the initial conditions categories that we had identified before entering the field. We have also added a new category. Market position represents a rigidity to the process of change. The markets explored by the firm can create a number of investment commitments and relationships that will make it difficult for the firm to achieve the necessary change. CIGNA decided to drop out of some markets, to concentrate on only a few products in which it saw better potential. The figure below illustrates the longitudinal process of strategy. In the next sections we address the drivers that transform the initial conditions into the final state. The table below sums up the categories of initial conditions that we have identified. Thus we have already the main elements of our model, that is presented in figure 3.2.
First Order Initial Conditions

<table>
<thead>
<tr>
<th>Technological knowledge</th>
<th>Articulation of cause and effect relationships in the production process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational Processes</td>
<td>Descriptors of shop floor behaviour</td>
</tr>
<tr>
<td>Business processes</td>
<td>The procedures followed in order to perform an operational task</td>
</tr>
</tbody>
</table>

Second Order Initial Conditions

<table>
<thead>
<tr>
<th>Managerial Processes</th>
<th>Descriptors of managerial behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management systems</td>
<td>Systems of incentive and control</td>
</tr>
<tr>
<td>Structure</td>
<td>Positions and roles in the organisation</td>
</tr>
<tr>
<td>Market position</td>
<td>Market segment targeted by the organisation</td>
</tr>
</tbody>
</table>

Table 3.1 - First and second order initial conditions

3.5. Organisational processes

The lean production paradigm makes a compelling case for the pivotal role of line managers and employees in doing most of the thinking that leads to continual improvement. In spite of this, little research has been directed at exploring the role of these actors (Winterscheid, 1994). We propose that a useful way of understanding the role of the bottom levels of the organisation, is to understand the patterns of behaviour that can be linked to superior operational performance.

The Toyota Production System (Womack, Jones, and Roos, 1990) allowed Japanese companies to change the nature of competition by altering accepted trade-offs and pushing the efficiency/quality frontier forward. Among the widely acknowledged good effects of going lean are the uncovering of bad practices and problems, and boosting productivity through the elimination of the capital costs of inventories. We observed a hidden but immensely beneficial effect of stockless production which is that it promotes positive patterns of behaviour. Machine operators separated by WIP buffers are almost...
completely cut off. The removal of buffers increases physical proximity and makes their tasks more inter-dependent. This facilitates great deal of communication and interaction among operatives. Superior behaviour makes up for the buffers and seems to constitute the basis of good performance.

From this point of view, the role of workers is more than filling suggestion boxes or participating in QCCs. Although the search for small improvements remains a central element for the learning organisation, we need to broaden our view of the contribution of the bottom of the organisation to the improvement of performance. The question to be answered is: how can a work force make a difference in the evolution of operational performance beyond solving local problems?

Suppose we have two groups of workers who have the same level of skills but have worked in different cultures, contexts, and management systems. It is reasonable to assume that although they have the same level of skills (like operating a machine) they will present different collective behaviour. It is in this distinction that we should look for clues about what is strategic in terms of the contribution of the workforce.

Garvin (1994) considers that behavioural processes are deeply embedded in the organisation, and the underlying behaviour patterns are exhibited by most members of the organisation, and survive staff turnover and change in leadership. Garvin quotes a study by Wheelwright and Clark (1992, pg. 184) to support the importance of underlying patterns of behaviour for operational effectiveness. This study compared product development processes with similar workflows which had differences in performance. It concluded that differences in performance could be traced to specific rich and frequent communications between the groups involved. In addition, these groups differed in their sense of “shared responsibility” and “mutual commitment to one another’s success”. The difference, the authors suggest, can be traced to certain cognitive frames that result in differentiated behaviour.
Behavioural processes are ‘intangible assets’. They cannot be mapped as business processes. Garvin (1994) considers that they can be divided into three categories: decision making, interpersonal, and organisational learning. Decision making is omitted because it is essentially a managerial attribution and we are only dealing with shop floor behaviour.

Learning and interpersonal processes (the latter understood by Garvin in terms of nature, quality, and direction of communication flows and the quality of interrelationship between group members) provided the initial basis for our investigation of the nature of organisational processes. After interviewing a number of staff and management in CIGNA, it could be observed that these categories were consistent and very salient.

The quality of interpersonal relationships and communications were clear manifestations of superior co-ordination behaviour. This was supported by management practices such as the open door policy and the daily meetings of the team leaders with the manager in charge of operations. This was also an opportunity to form a collective strategy to deal with contingencies. The quality of the relationship and information flow within the teams was of the highest and team members were satisfied with their teams. Continuous improvement was everyone’s responsibility. Personal development was considered as part of continuous improvement activities, and the reward system was designed to foster the development of new abilities and training.

Beyond interpersonal relations and learning, we observed a third category of behaviour that was consistently reported to be very significant. This was staff entrepreneurship. As a manager said:

Our staff is miles ahead. That is the key to it... Recently I was over in another office of ours in Europe, it was a very small company but they had a big problem because the appetite for doing it is not really there.

Thus behavioural processes are important in three areas: (a) how well the organisation co-ordinates their members’ efforts to perform tasks (quality of interpersonal
relationships), (b) how effective the organisation is in learning, and (c) how strongly the organisation pursues (a) and (b) and overcomes implementation hurdles. These categories of behaviour correspond respectively to interpersonal processes - understood as co-ordination behaviour, learning, and entrepreneurship. We argue that each of these behaviour dimensions can be linked to superior operational performance. We use case data and various works in the literature, which consider each of the processes individually, to define and determine the attributes that should be used to measure it.

3.5.1. Co-ordination

The interpersonal processes as defined by Garvin (1994), relate to the communication and interrelationships among workers. We associate these patterns of behaviour with what Gittel (1995) calls co-ordination. It can be argued that cross-functional co-ordination is critical to superior operational outcomes (Gittel, 1995). Hierarchical organisations divide the work into functions to facilitate control. However, tasks that involve high interdependence of the various functions and require quick co-ordination of the workflow, make it difficult to be managed as independent sub tasks. Due to this fact, superior cross-functional co-ordination is associated in the literature with superior performance in tasks that involve complexity and speed.

In hierarchical organisations complexity and speed pressures are handled through the use of buffers and other forms of organisational slack (Galbraith, 1973). Gittel (1996) studied the flight departure process in commercial aviation that “requires a high degree of synchronisation under time constraints for its successful completion”. She demonstrates that while other airlines dealt with late arrival and lost baggage by increasing staffing and/or scheduling longer turnaround time at the gate, Southwest challenged the competition on the grounds of a superior ability to co-ordinate cross-functionally. The superior co-ordination processes enabled Southwest to have the fastest turnaround times - 15 minutes against an industry average of 35 - as well as the highest reliability.

Something similar happened in CIGNA. In the beginning, the company operated as isolated departments where operators performed only one step of the production process.
WIP buffers separated production stages and the average turnaround time was more than three times longer than it is now. When a contingency arose, it was very difficult to persuade people in different functions to co-ordinate their efforts in order to handle the situation. Also, the development of any sort of interpersonal process was made virtually impossible by physical separation.

The creation of teams brought a radical change. People are now individually responsible for all tasks, and can ask for immediate help from anybody in their team who works in close proximity to them. There are no longer WIP buffers. Team members are strongly bonded together and demonstrate high teamwork ability. The communication among the teams is highly developed and team leaders are in constant communication through formal or informal meetings. Teams commonly volunteer to take on extra workload when other teams are having problems with excess work. Gittel associates superior co-ordination with superior operational performance in the Southwest case. Likewise it can be argued that extraordinary results in CIGNA are linked to its superior ability to co-ordinate the efforts of organisational members.

3.5.2. Attributes of co-ordination behaviour

Gittel (1996) identifies several dimensions which characterise differences observed in cross-functional co-ordination among the main American carriers. She broke down these differences into a set of co-ordination behaviour categories deducted from grounded research. They are: interdependency, timeliness, and frequency of communication, problem solving versus blaming, and helping out. They are largely coherent with Garvin’s theoretical idea of interpersonal processes. He says:

...a company’s interpersonal processes may be based on open sharing or hoarding of information, one-way or multidirectional flows of information, open discussion or suppression of conflicts, attention to or neglect of group dynamics and relationship building, pressures for conformity or encouragement of different points of view, an atmosphere of fractiousness and contentiousness or politeness and mutual supportiveness and fact based opinion and rank-based discussions.
We identify and measure co-ordination behaviour based on the dimensions proposed by Gittel. Interdependence, timely and frequent communication are prerequisites for effective teamwork. The quality of the flow of information can be understood in terms of how dependable the information flow is, and how open people are towards information sharing. Information can either be hidden to avoid blame, or shared, characterising a behavioural trend towards problem solving. Finally, the quality of personal relationships is measured in terms of the readiness of employees to help their peers out and by going beyond their job definitions to help colleagues carry out their work. The initial attributes of co-ordination are:

- Interdependence
- Timeliness of communication
- Frequency of communication
- Problem solving versus blaming
- Helping out

3.5.3. Entrepreneurship

Entrepreneurship is still an ambiguous term in business literature which leaves a margin for different interpretation. It would nevertheless be reasonable to argue that it does not refer to one single phenomenon, but instead, to several categories. According to Stopford and Baden-Fuller (1994) the literature recognises at least three categories: (a) the creation of new businesses within an already existing organisation, (b) the renewal of ageing organisations, and (c) a view close to Schumpeter (1934) which sees entrepreneurs as introducing novelty, changing the rules of the industry, and appropriating abnormal rents until the advantage is replicated. Our view is based on the entrepreneur behaviour of line managers and employees who demonstrate spontaneous behaviour towards transforming the production function.

Doz (1994) argues that individuals and small groups are the starting point for collective competencies. Stopford and Baden-Fuller (1994) have shown that organisations differ in their entrepreneur behaviour at managerial level. Similarly, we propose that organisations
can also be expected to differ in their entrepreneurial behaviour at the bottom level, and that this is relevant to strategic outcomes. Individuals who proactively pursue organisational learning and co-ordination and overcome barriers to the implementation of changes, give the organisation an innate ability to continuously renew its processes. Managers in CIGNA attribute their edge to the unmatched enthusiasm of their workforce. This was consistently evident in interviews with both staff and management. Based on available literature and site observations the main categories of entrepreneur behaviour are specified next.

3.5.4. Attributes of entrepreneurship behaviour

Stopford and Baden-Fuller (1994) suggest at least two sets of attributes that are common to all types of entrepreneurship and were found by us to be relevant during grounded research. The first is team-orientation. We interpret this as an individual's spontaneous creation of interpersonal links with other peers within and beyond traditional functional boundaries. The bonds that united people within the teams were very strong. They had been working together for several years and each team had its own name and had developed an individual identity.

The capability to resolve dilemmas is another dimension of entrepreneur behaviour. Every day operations, specifically those activities that involve time constraints, face challenges of conciliating conflicting objectives and interests. The willingness to tackle these dilemmas, instead of “passing the bucket”, and to show creativity in finding solutions are clear manifestations of entrepreneurship. Again, this behaviour was clearly observed in CIGNA where one person is made responsible for all issues involving a group of customers and has to deal with all contingencies. The intervention of the team leader or the manager in charge is rarely necessary.

Stopford and Baden-Fuller (1994) complement the categories above with two other dimensions that emerged from their research. The first dimension is proactiveness which can be associated with the willingness to break with past behaviours. This proactiveness could be observed in CIGNA where there was an enthusiasm for continuously embracing
change. This became evident when the firm moved from functional structure to process complete cells. Line workers had to “unlearn” most of their old practices and behaviours and learn new ones. They embraced the change with total commitment. They also actively participated in re-engineering projects that continued to introduce change after the teams were already stable.

The second dimension is aspirations beyond current state. This refers to the aspiration of those that participate in the process to find a better combination of resources in their pursuit of a goal of continuous improvement beyond what is perceived as adequate. Although production function performance was producing superior results in comparison to benchmark competitors, and managers were not exerting pressure, workers kept up the will to improve. According to managers, teams were disputing about who should get new accounts and they kept setting slightly more ambitious goals each time. Staff were also visibly concerned about pursuing personal development and were engaged in varied kinds of training and courses. Thus an initial list of entrepreneurship attributes includes:

- Team orientation
- Ability to solve dilemmas
- Willingness to break from past behaviours
- Aspirations beyond current state

3.5.5. Learning

Kim (1993) reminds us that the dictionary definition of learning is “the acquiring of knowledge and skill”. Duncan and Weiss (1979) proposed that the effectiveness of the organisation was dependent on its members’ ability to continuously determine and carry out actions that would achieve desired outcomes. Choices of actions, therefore, were based on prior knowledge of action and outcome. Organisational learning was defined by these authors as:

The process within the organisation by which knowledge about action-outcome relationships and the effect of the environment on these relationships is developed ... in organisational learning we are concerned
with the development of the knowledge which would make such change possible or indeed necessary.

Initial conceptualisations of organisational learning referred to an adaptive process through which organisations interact with the environment, map cause-effect relationships, and then use this knowledge to inform their actions and influence the environment. Senge (1990), however, argues that models that emphasise increasing adaptability are portraying only the first stage of the process that leads towards this learning organisation. He argues that leading organisations focus not only on "adaptive learning, that is about coping, but also on generative learning, which is about creating".

Argyris and Schon's (1978) concept of single-loop and double loop captures the division between tacit and articulated learning. Single loop learning occurs whenever an organisation implements the solution of a problem into a stable routine. By learning from previous experiences, organisations develop a repertoire of standard operating procedures, informal and formal control systems. Double loop learning refers to the second half of Deming's (1982) cycle: check and act. It is about understanding the cause-effect relationships that condition current behaviour. It involves challenging assumptions and procedures deeply embedded in the organisation.

Similarly, Kim (1993) makes a basic distinction between the two types of learning efforts: operational learning and conceptual learning. Operational learning refers to "the acquisition of skill or know-how, which implies the physical ability to produce some action". Conceptual learning is "the acquisition of know-why, which implies the ability to articulate a conceptual understanding of an experience".

At this point, our discussion of organisational knowledge should be narrowed to consider only the part of organisational knowledge that concerns the production processes of the firm. Bohn (1994) defines technological knowledge as the "knowledge about how to produce goods and services". He argues that technological knowledge is directly linked to superior operational outcomes.
Chaparral steel, a mini mill, was able to double output from its original electric furnace and caster. Semiconductor companies routinely increase yields on their chip fabrication lines below 40 percent to above 80 percent during a period of several years. In these cases incremental capital investments are minimal. The improvements are instead due to multiple changes in the manufacturing process, including different procedures, adjustment of controls, changes in raw material recipes, etc.

Why weren't these changes implemented at the start-up? The reason is that the knowledge about the process and how to run it is incomplete and develops through various kinds of learning.

Bohn (1994) goes beyond the dual distinction between tacit and articulated organisational knowledge. He proposes an eight-stage scale of technological knowledge that reflects the ability of the organisation to articulate the variables of the production process, and how their manipulation can produce effects in the production's outcome.

But how do organisations learn? Many authors observe that they depend on their members for learning. Theories of organisational learning (Kim, 1993; March and Olsen, 1976; Senge, 1990), and assumptions about the development of distinctive competencies (Doz, 1994) are based on the development of learning at the individual level. At this point it is important to consider the scope and depth of search.

Mukherjee (1992) argues that the literature under-emphasises the idea that organisational search is orientated towards establishing control of the production process. Cyert and March, he notes, assumed that search begins locally, and if it fails then it will assume a wider scope. On the other hand, the depth of knowledge necessary to control production process is likely to be much more shallow than the depth of knowledge necessary to understand the cause and effect relationships behind it. Consequently, we can conclude that organisational learning efforts that aim to control variations in the production process may not necessarily lead to an increase of knowledge. This is because process control's search routines are limited in scope and shallow in depth. They are, thus, unable to lead to an articulation of the factors that affect the production process as a whole.
The scope of the learning behaviour measured here is by definition local because we are considering ingrained patterns of behaviour manifested by individuals or small groups. The depth of search, on the other hand as observed in CIGNA, was a shallow one. In other words, it could lead only to increased know-how instead of know-why. Therefore, if learning, as considered here, did not lead to higher stages of knowledge how could ingrained patterns of behaviour contribute to the evolution of the organisation's learning?

The importance of ingrained patterns of behaviour could be observed in CIGNA in terms of the ability of the organisation to disseminate new knowledge and quickly adopt new practices. Thus the relevant dimensions of learning behaviour are those that reflect the ability of the organisation to deal with potential problems that threaten the learning cycle.

It could also be observed that search routines were intertwined with the control of processes. We have to distinguish between search and dissemination routines. We understand learning behaviour only in terms of dissemination routines. Search routines, considered as random processes through which individuals find solutions to production problems, cannot be considered as systematic learning behaviour (Argyris and Schon, 1978). Relevant search routines are related to the control of processes and will be addressed in a later section when the management of business processes is discussed. Therefore learning at the bottom of the organisation occurs on two fronts: search routines associated with process control and dissemination routines.

3.5.6. Attributes of learning behaviour

March and Olsen (1976) identify four problems in the process of transferring learning from individual to organisational level. The first is role-constraining which occurs when individual learning cannot affect organisational behaviour because the individual or small group who develops some new knowledge is not able to influence other people's behaviour. When individuals can alter organisation behaviour but do so in an ambiguous way audience learning problem occurs. Imperfect learning may also arise when beliefs based on untested assumptions influence the perception of the environmental responses to
actions implemented. Finally, individuals who do not understand the cause-effect relationship between the actions taken and the environmental response learn under ambiguity.

Kim (1993) adds to March and Olsen's model. He proposes three other types of incomplete learning cycles two of which are important to our study. Situation learning occurs when individuals solve problems but do not codify their learning for later use. Therefore mental models are not altered and learning is only temporary. Fragmented learning occurs when individual learning fails to become organisational learning because the lack of networking prevents individuals in the same organisations from sharing knowledge, or when individuals who concentrate knowledge leave the organisation.

Based on potential problems, which may occur during the process in which knowledge is transferred from individuals to the organisation, we can propose several categories of behaviour. The efficiency with which the organisation closes the learning cycle depends on the level of intensity and nature of these behaviours:

- Readiness to adopt suggestions coming from all levels
- Group discussion to eliminate ambiguity and create a "common mind"
- Efforts to articulate knowledge (local vs. general)
- Willingness to assess environmental response
- Documentation of experiences
- Networking throughout the company to share and enrich knowledge base
- Avoiding the concentration of knowledge on a few individuals (dissemination of knowledge)

![Figure 3.3 - The organisational processes of the organisation](image-url)
3.6. Managerial processes

Garvin (1994) reviewed the strategic management literature and found three broad categories of managerial processes: direction setting, negotiating and bargaining, and monitoring and control. The most obvious managerial process in the strategic management literature, and the only one recognised in most of the operations literature, is direction setting. The manufacturing strategy literature was based on the principles of the classical school of strategy\textsuperscript{14}. It shares the principles of a long tradition of prescriptive literature which can be traced back to Chandler (1962), Ansoff (1965), and Andrews (1971) and more recently to Porter (1980, 1985). The essence of strategy according to this view, is direction setting helped by the use of analytical tools.

However, revisionist writers on strategy note that there is no mono-causal explanation for superior performance and the strategic process. The process, they argue, is adaptive and requires other managerial processes than a unidimensional top down intervention in the form of defining actions that should be taken in order to close gaps. Pettigrew and Whipp (1991) demonstrated that high performance companies have a number of distinctive senior management processes grouped into five main dimensions:

a) Assessing the environment: Understanding that the environment should not be seen as a technical exercise, but instead as a process of learning that is not limited to specific functions or actors.

b) Leading change: An effective leadership would be able to cope with the particular context in which the organisation is embedded, creating the right environment and mobilising the organisational energy to support the change process.

\textsuperscript{14} Regarded here as incorporating the design, planning, and positioning school, according to Mintzberg's (1990) typology.
c) Managing human resources: Selection, training and development, employee relations and compensation need to be managed within a long term framework necessary to build the right set of invisible assets, knowledge, skills and attitudes that the organisation needs to compete.

d) Achieving coherence in the management of change: Coherence must be achieved among strategy goals, incremental response to the environment, functional strategy, and the relations of the firm with its customers and suppliers.

e) Linking strategic and operational change: The core issue here is to manage the interrelated analytical, educational, and political dimension of the process. Intentions must be broken down to manageable pieces and assigned to change managers. This process of clarifying the strategic targets needs the support of redesigned communication and reward system.

We cannot make direct use of the dimensions above because they cannot be understood as categories of managerial processes. Nevertheless, these categories are an important reminder of the multifaceted activities of managers during the strategic process, and suggest specific categories. In contrast, the MSM suggests a unidimensional intervention from management. There is plenty of evidence which can be drawn from the adaptive tradition of strategy to support the idea that managerial intervention in the evolution of operational abilities is somewhat more complex. Skinner had already called attention to "production systems" that went beyond structural gap closing, although he did not explore the issue much further.

Hayes and Wheelwright (1984) have suggested that Japanese advantage lies in effective infrastructure systems developed in a rather adaptive way. Hayes and Pisano (1995) revisited the MSM and considered that infrastructural decisions are more important than structural ones. They write: "These systems should be designed to encourage adaptation and improvement of an organisation skill base rather than to achieve some 'optimal'
strategic fit". However, as noted by Wheelwright\(^{15}\) whereas structural decisions are supported by hard analysis, soft issues often defy analysis, which makes it more difficult to set gap closing goals and requires managerial commitment and leadership.

Note that although Hayes and Pisano (1995) call for a revision of the MSM, the emphasis is still on decisions. We think that the answer to the new strategic questions should be found on the infrastructure side. However, what managers actually do, is more important than the strategical decisions they take. This is why we consider processes instead of decisions. It should also be noted that managerial process encompasses decisions. Garvin's (1994) broad division of managerial processes into direction setting, getting support and controlling found correspondence in the strategic process experienced by CIGNA. Based on the data collected on the behaviour of management during the process, more detailed categories can be proposed:

**Gap closing** - refers to the content of strategy or, in other words, how management identifies the performance gaps and defines action plans to close them. According to the manufacturing strategy literature, this is the only dimension of management intervention to be considered. In CIGNA, the identification of gaps received great attention and management time. Broad action plans were then formulated with the help of the expertise accumulated by the parent company which had had similar experiences in the US.

**Management style** - refers to how managers go about making, communicating, implementing, and adjusting decisions. These dimensions of managerial behaviour were observed to be especially important in the shaping of a new internal environment.

**Senior management teamwork** - refers to how effectively top managers and their respective areas collaborate towards strategic goals. The evolution of operational performance was dependent on the collaboration of the whole management team. The CEO and the change team dealt with this process carefully. Development of appropriate processes of this kind was considered a major issue.

\(^{15}\)Cited in Hayes and Pisano.
**Performance control** - encompasses the metrics and systems used by managers to measure operational performance and the actions which management take based on that. A consistent set of metrics was developed by CIGNA to follow the evolution of the change process. These metrics reflected the strategic directions defined in the gap closing dimension and focused managerial and staff attention on those specific dimensions of performance.

**Aligning behaviour** - refers to leadership and the use of mechanisms such as reward and control systems to shape people’s behaviour and align the actions of the low hierarchical levels to the achievement of strategic goals. Financial rewards were used in the beginning to emphasise the importance of team-based performance. It was later substituted with greater emphasis on non-financial rewards. Leadership was vital during the three phases of the change process (unfreeze, change, freeze), varying in style according to the phase.

The definition of concepts identified by grounded research is an essential step because it forces a more precise definition of concepts that are somewhat intuitive. The issues in the literature, which are related to the categories identified, are now reviewed.

3.6.1. Gap closing

If we assume the existence of a link between strategic intentions and operational outcomes, direction setting is an important managerial process. Sanchez and Heene (1995) consider that managers are compelled to adopt strategic actions when they perceive a gap in the capabilities of the firm. They write: “A firm's efforts to change the state of one of its system elements will be motivated by managerial perception of a strategic gap between the desired state of a system element and the perceived state of the element”. When this gap is big enough to induce action then, “managers will initiate some form of gap-closing action to improve the state of that system element. Actions intended to close strategic gaps in the system elements are the source of strategic change.”
According to these authors, such actions may take two different courses: competence building and competence leveraging. Competence building involves "creating or adopting new capabilities" (new patterns of action) in the use of new or existing assets. Whereas, competence leveraging involves the exploitation of new opportunities created by competence building, implying a quantitative change in the assets. When formulating gap closing action plans, managers may focus on structural and infrastructural issues and have different ex-ante cognitive understanding about objectives and the means to achieve them.

3.6.2. Management style

The managerial processes through which managers determine the internal context during the strategic process are the key to strategic outcomes according to adaptive authors in strategy. At its most basic, managers can approach the strategic process in a programmatic or emergent fashion. In programmatic modes of implementation, the role of senior management is to act in military-like fashion as commanders where organisational members are subordinates who are not able to provide inputs into the process.

This view is best represented by the design school which relies on formal analysis of the environment and inflexible implementation plans (Mintzberg, 1990). Starting with Skinner's (1969) original formulation, the majority of the views on the manufacturing design process have espoused the Design School's analytic approach (Mills et al. 1995). This means assuming perfect rationality of senior management and perfect alignment of organisational members to whatever senior managers decide.

At the other extreme is the emergent mode of strategy implementation termed by Hart (1992) as "transactive". This involves a continuous vertical flow of information in both directions, in order to operationalise the strategic intent. Senior management is described as acting as a "facilitator" because it puts a premium on "learn and improve". It thus empowers and enables organisational members to provide inputs into the project.
The style of managers should stand somewhere in the continuum between decisions taken exclusively by managers and the full participation of lower hierarchical levels in the decision making process.

3.6.3. Senior management teamwork

One of the core ideas behind the concept of manufacturing strategy is to achieve coherence in the strategic efforts of several functions. Special attention is placed on the co-ordination of the manufacturing/marketing interface as their combined action will lead to the materialisation of the strategic intent dictated by corporate strategy. Hill (1985) focuses on facilitating the co-ordination of this interface through the use of hygienic and enhancing factors which he calls “order winners” and “qualifiers”. He suggests that actions aimed at performance improvement in operations should be guided by market considerations. Interaction between the two (or more functions) should be limited to the definition of the content of strategy. Once function's top managers agree on the course of improvement, each function is free to follow its own independent course.

Stopford and Baden-Fuller (1994) provide evidence of the strategic importance of teamwork at the highest hierarchical level. One of the companies they studied is a UK pump manufacturer who introduced revolutionary order processing. They observed that interaction between senior management of the various functions in the strategy process, is perhaps more important than simply agreeing on basic directions. They write: "The system design required inputs from every function over many months and its successful implementation required fundamental operating change in most functions". According to Garvin (1994) in order to get the job done once the direction is set, workers will need the collaboration of organisational members outside their work groups. As these relationships lack formal authority, a number of other means, like networking and negotiating, may be necessary. The managerial processes used to tackle organisational dilemmas and trade offs in order to achieve collaborations among several work groups, are therefore key to the strategic process.
3.6.4. Performance control

Managers use critical performance variables to track the organisation's progress towards strategic goals. Outputs are measured and compared against pre-set targets (Simons, 1995). These control systems provide the basis for gap-closing actions. Sanchez and Heene (1995) call control loops the “system processes through which a firm monitors and adjusts its stocks and flows of assets”. They contend that organisations may rely on unambiguous "hard" data that may say little about competence building, or in other words, on the qualitative change happening in the organisation. Thus to achieve the transformation of higher order elements, the organisation will have to go beyond the use of hard data and rely on more informal means of data gathering. Benchmarking, environmental scanning, and challenging cognitive frameworks are regarded as appropriate control loops to guide qualitative changes.

A possible down side to reliance on control loops is the blindness to other factors. Existing control loops focus on the needs of current “path”, and therefore exclude other valuable information. As explained by Stopford and Baden-Fuller (1994) “the known informs strategic choice: the unknown is ignored”, in other words, “what gets measured gets done”.

3.6.5. Behaviour alignment

According to Pettigrew and Whipp (1991), the design of performance and reward systems are important elements in the strategy process. Reward systems are part of the systems used by the firm to control employees' behaviour. They are used by hierarchical organisations in a relatively straightforward way. The reward in such cases is attached to the attainment of local functional goals, which can be verified by arm’s length indicators. Companies that develop lateral integration need to design incentives linked to the achievement of broader goals that can be more ambiguous in both whether or not the goal was achieved and who contributed to it (Galbraith, 1995).
It has been argued that a number of organisational practices can change the way people think about their jobs and their relationship with other organisational members, and consequently influence or even determine behaviour. Among the organisational practices identified by Gittel (1996) as those that influence co-ordination behaviour are: shared accountability, qualitative feedback, dedicated co-ordinator, conflict resolution, and hiring for teamwork.

Simons (1995) proposes three other forms of control lever: belief systems, boundary systems, and interactive control systems. The need to release formal control to create empowered employees who are able to generate new ideas, places even greater importance on communicating core values and missions. Belief systems are used to inspire employees and communicate the direction senior management wants them to follow. Alternatively, boundary systems are stated in negative or minimal terms. They tell people what not to do. They are the mechanisms against opportunistic behaviour. Interactive control systems are “the informal information systems that managers use to involve themselves regularly and personally in the decisions of the subordinates” (Simon, 1995). Interactive control systems are designed to promote face-to-face communication among the several levels of management to evaluate qualitatively constantly changing sensitive data in order to explain through debate the underlying assumptions and actions plans.

Throughout the change period, leadership has to deal with and adapt to three distinctive phases of induced change processes. According to Lewin’s (1952) and Schein’s (1972), model the three phases are: unfreezing, changing, and refreezing. The first stage corresponds to an assessment of the initial state of the organisation, and efforts to break previous behaviours in the organisation. The second period is a state of flux where old practices and behaviours are gradually replaced. The final stage refers to the consolidation of the new practices and their adoption throughout the organisation.
3.7. Process control and redesign

What an organisation is able to produce is the result of the performance of the sequence of business processes involved in the production of goods and services. It has already been argued that the effectiveness of these business processes is influenced by the organisational behavioural processes. However, these processes do not interfere with the tangible sequence of steps. Thus, apart from organisational and managerial processes it is necessary to consider the mechanisms through which the organisation shapes production business processes. The literature on reengineering says that managers manage these processes by redesigning inefficient ones. Also process control, defined by Mukherjee (1992) as “the science, technology and art of ensuring that a production system (or its subparts) produced the output that it is meant to produce”, is a means of management intervention over business processes.

Managerial processes indirectly affect business processes by influencing the development of behavioural processes (learning, entrepreneurship, and co-ordination) but do not interfere directly with them. Process control and redesign cannot be included in the category of managerial processes because they do not represent ingrained patterns of behaviour. Re-engineering projects are one-off temporary change programmes which have a beginning and an end. Similarly, process control refers to a set of techniques adopted by line management and executed by operatives.
Based on Garvin (1994) we have already argued that the view of the organisation as structure and systems was replaced with advantages by one that sees the organisation as a bundle of processes. We had expected that the patterns of behaviour at both managerial and other levels would explain the evolution of operational performance, but field experience in CIGNA made it clear that they were not enough. We found that the transformation of business processes could not be associated with the activities of any group of individuals in isolation. This transformation is better understood as an organisational action. Our general model of performance improvement is complete only if we treat business processes as different in nature from other organisational processes, and therefore explicitly consider how organisations manage their physical transformation.

The manufacturing strategy literature, particularly the work of Hayes and Wheelwright, sees managers indirectly influencing what happens in the production function by defining the right systems and structure. By considering the role of process redesign and process control, we attempt to integrate these literatures within a broader strategic framework.

Process control and redesign is, therefore, an important intermediary category, standing between managerial and organisational behavioural processes. It fills a gap between the highly aggregated nature of senior management processes and the emergent nature of work process improvement. The two major paradigms of process control and redesign, TQM and BPR, give us the appropriate background to understand the mechanism used by management to introduce change in the organisations’ business processes. The process control literature provides valuable insights into organisational learning.

Learning has to occur in the factory. This is contrary to the Tayloristic paradigm. It also contradicts the assumption that underpins operations research. The basic assumption is that knowledge about product and process is complete, and the role of management is to define the best way of production and specify what labour should do to execute it (Jaikumar and Bohn, 1992). Process control is central to the development of knowledge in the production setting. Jaikumar (1988) notes that the kind of knowledge acquired, how it is applied, and the issues tackled depends on the process control efforts adopted by
the firm. The development of knowledge of a practical as well as a scientific nature is critical to the improvement of the production function (Hayes et al., 1988).

We have split organisational learning into two categories: (a) search and (b) diffusion and assimilation. Diffusion and assimilation are embedded in behavioural processes and search was found to be dependent on approaches to process control. This view is consistent with those of other writers in the field such as Jaikumar and Bohn, and Mukherjee.

3.7.1. Process control and organisational learning

The management of processes is deeply connected with organisational learning. There are striking parallels between the learning literature and the TQM literature. TQM is related to the concept of organisational learning advocated by March and Olsen (1975) and Nelson and Winter (1982), who regard learning as being produced and used by individuals (we could extend this definition to subgroups such as QCC).

Duncan and Weiss (1979) criticise the view that learning occurs only through individuals or small groups because otherwise organisational knowledge would be fragmented and only relevant locally. Argyris and Schon (1978) argue that the random learning process through which individuals encounter relevant factors and manage to produce useful statements of cause and effect is not enough to “provide a basis for describing a systematic learning process”.

The duality between local and organisational wide learning can be observed in production systems. Factories can either learn at the operator individual level, as it is common, or attempt to develop knowledge about key variables (related to product, process, and environment) that consider the whole production process and its system-wide effects. Capturing this duality Mukherjee and Jaikumar (1995) propose the existence of two paradigms that “embody an internally consistent set of goals, skills, tools and procedures for process control”. The first, called six-sigma paradigm, is rooted in the quality
literature and makes extensive use of statistical process control, policy and tools that are assumed to improve quality.

The production theory paradigm, as they call it, “requires plant personnel to identify the interlocking set of product, process and environment variables which govern their product-process system” (ibid.). The two paradigms emphasise learning at different levels. The six-sigma paradigm advocates that process be broken down into key steps and analysed in isolation, thus producing local learning. However the production theory paradigm emphasises general learning.

General learning is produced by plant and R&D personnel undertaking cross-functional problem solving over data on product, process and environment which could potentially affect quality and productivity. The idea is to understand what the systemic effects of these variables are. Control (statistical or not) should then be imposed upon these variables.

The authors argue that the idea of the new paradigm can be related to the stages of knowledge proposed by Bohn (1994). It is a useful a way of knowledge development for firms at low stages of knowledge, who know little about their product and process’ key variables and their effects. It is also argued that firms that have achieved higher levels of knowledge can identify the effects of secondary and tertiary variables.

Hayes et al. (1988) note that in order to increase control over process consistency, a firm has to learn. Initially learning occurs by controlling abnormal variation. They call this reactive control. A second step, they call preventive control, requires an understanding of first order causal effects and the elimination of sources of abnormal variation. A third stage, called progressive control, requires detailed experiment and analysis, and therefore is not the responsibility of line operators as in the first two cases. As Hayes et al. (1988) observations and the two paradigms of process control suggest, the scope and depth of problem search have implications for behavioural and cognitive change in the organisation.
3.7.2. TQM

TQM, as well as BPR, became a very influential concept in a relatively short period. So influential was the idea that the regaining of competitiveness by companies such as Ford and Motorola is perceived as due to the implementation of the concept. Juran (1993) goes a step further and credits TQM with the restoration of the competitiveness of the whole American economy.

TQM is said to have originated from a course on statistical quality control for Japanese managers set up by a committee appointed by the Japanese government. The techniques for quality control were then applied within the philosophy developed by Deming (ibid.) and Juran (ibid.). The rise of Japanese manufacturing firms in the late 1970s and early 1980s, which showed the superiority of Japanese manufacturing, greatly increased the profile of the so called “Japanese techniques”. The benchmark of these techniques developed into what is now called TQM. Some of the most popular perspectives are: Deming’s 14 points, the Juran trilogy (1992), and Crosby’s 14 quality steps.

Considering the principles set by these seminal works on quality and also by the criteria on which quality awards (e.g., the Baldrige Award) are based, it can be inferred that TQM is a philosophy that focuses on meeting customers’ requirements. Its central characteristics are: term planning, continuous improvement, human resource development and increased importance of workers, benchmarking, redesign, and team-based problem solving (Powell, 1995). Compared with the Tayloristic paradigm of scientific management of production, TQM philosophy represents a revolution. Knowledge that was previously regarded as being the province of managers has now extended to the workers (Mukherjee et al., 1995). It would be instructive to summarise the main ideas of the quality gurus to understand the ideas and practices behind TQM.

3.7.3. Quality gurus

Deming (1982) puts forward the idea that quality has a positive relation to cost, instead of being part of a zero-sum game where one dimension can only be improved at the expense
of the other. He also suggests that 85 percent of the quality problems that a firm experiences are the responsibility of management who fails to develop appropriate systems and processes. Management should first eliminate the common causes of quality problems provoked by poor design, poor standards of the material supplied, inadequacy of the equipment, and lack of training and supervision. Workers should concentrate on the causes that are peculiar to their processes. It is the responsibility of the operative to eliminate the problem(s) that cause variation in the output.

However, Deming does not consider that superior quality starts and finishes on the shop floor. He calls for a deeper change in the organisation. It should develop appropriate supervision style, internal communications, performance measures, and commit itself to quality, innovation, and training.

Crosby (1979) coined the phrase “Quality is free”, and urges companies to pursue the ultimate goal of zero defects. He concentrated on managerial processes and gave secondary importance to the role of operators. The firm, he advised, should implement a “management maturity grid” to improve communications among management layers. Using the grid managers would be able to express their perception of the state of quality in the firm. Following the assessment step, the organisation would be able to commit itself to a 14 steps programme.

This programme, the aim of which is to detect improvement opportunities, requires the establishment of performance indicators in each area of the company. It is supported by the ability to perform cross-functional co-ordination of the quality efforts, and training of supervisors among other things. Quality is regarded by Crosby as conformance to design requirements.

Juran and Gyrna (1980) defined quality as “fitness for use” and argued for the optimisation of quality costs. They recommend that firms develop a data system which enables them to measure the costs incurred by defective output and the costs of preventing those defects. The idea is to operate at the conformance quality level which
would minimise the cost of quality. Although in theory a firm could benefit from reducing its conformance quality levels, Juran and Gyrna believe that these would be very special cases and the bulk of companies should reduce their total costs by increasing the preventive costs.

When failure costs are very high, Juran (1992) considers that the organisation should consider a breakthrough project. Key projects should be identified with the help of Pareto analysis, and multi-functional steering and diagnostics committees should be assembled. Diagnostics committees then analyse the problem and collect the relevant information in order to propose solutions to problems which can be divided into management-controllable (what should be 80 percent of the total) or operator-controllable problems. The steering committee should concentrate on overcoming resistance to change.

Key controls should also be implemented to follow the development of the project. Costs and benefits of the changes should be assessed, and management should use communications and training to institutionalise the changes. If the organisation has achieved the optimal cost point, operators should concentrate on controlling the processes and targeting eventual abnormalities. The organisation should also make use of an annual quality programme focused on determined objectives. The key points of the quality literature are summarised in the table 3.2.

The Taguchi method is in essence different from the rest of the quality literature because instead of controlling the sources of variances in the manufacturing process it argues that poor quality is primarily caused by product design. It should therefore be cheaper to design products which are robust enough to withstand noise factors rather than trying to control them.
**Deming’s 14 points** | **Juran trilogy** | **Crosby 14 quality steps**
--- | --- | ---
Constancy of purpose | 1. Quality Planning | Management commitment
Adopt the philosophy | Set goals | Quality improvement teams
Don’t rely on mass inspection | Identify customers and their needs | Quality measurement
Don’t award business on price | Develop products and processes | Cost of quality evaluation
Constant improvement | 2. Quality control | Quality awareness
Training | Evaluate performance | Corrective action
Leadership | Compare to goals and adapt | Zero-defect committee
Drive out fear | 3. Quality improvement | Supervisor training
Break down barriers | Establish infrastructure | Zero-defect day
Eliminate slogans and exhortations | Identify projects and teams | Goal-setting
Provide resources and training
Eliminate quotas | Establish controls | Error cause removal
Pride of workmanship | Quality Planning | Recognition
Education and retraining | Quality councils
Plan of action | Do it over again

Table 3.2 – Quality Gurus. Adapted from Powell (1995)

### 3.7.4. Reengineering

With its promises of dramatic improvements, and numerous success stories associated with reengineering projects constantly appearing in both the popular and academic press, it is no wonder that reengineering has become a top priority for many CEOs. But what is reengineering anyway?

Hammer’s (1990) ground-breaking article “Don’t Automate, Obliterate” is said to be the spark that initiated the reengineering movement. In that article he defines reengineering as “the use of modern information technology to radically redesign business processes”. The emphasis on information technology was later reduced, being replaced by an emphasis on the human factor. As a Rover manager cited in Maull et al. (1995), puts it: “95 per cent of BPR is about the human factor”. Maull et al. also report that among the several companies they investigated, only one had its project driven by IT considerations.
Champy (1995) when compared with Hammer and Champy (1993) also identifies this change of emphasis from IT to human resources as the main engine behind BPR.

A common feature of the several definitions of BPR is that it should begin with a “clean sheet of paper”. Its aim is to achieve breakthrough improvement in an activity that can influence the competitive position of the firm. But does reaction or opportunity drive BPR? The popular press normally associates BPR projects with performance crisis. However, Dixon et al. (1994) found that out of the 15 reengineering projects they studied, only three were driven by reaction to crisis. This suggests that firms may employ BPR in a more proactive way than initially assumed. However, the alignment of BPR efforts with business strategy, even when driven by opportunity instead of reaction, should not be taken for granted.

Maull et al. (1995) report that they initially assumed an alignment between BPR projects and business strategy. However, during their research they perceived that although alignment was important “it could not be assumed to exist”. Indeed, some companies were having “considerable difficulty in achieving such alignment”. The lack of alignment between strategy and processes leads to local improvements that, although successful, cannot alter the competitive position of the firm. They write:

Processes were mapped, analysed and improved incrementally on a project-by-project basis. Little or no attention was paid to the overall strategic direction of the business. Consequently, while improvements were undoubtedly made, very few substantial changes to the company’s cost base or level of service were achieved. (ibid.)

Reengineering projects are also distinguished by reliance on teams and strong leadership from a process champion. Teams are the central features of reengineering design and implementation. Firms are advised to set up cross-functional teams to be integrated with experts and line managers. The project champion, who many times happens to be the CEO, symbolises the direct involvement of senior management in detailed operational matters.
Several authors have proposed critical determinants for the success of BPR programmes. Hall et al. (1993) and Maull et al. (ibid.) suggest that successful BPR programmes have a number of defined characteristics. Based on these factors and on the literature covered previously, we can identify those issues which are more likely to characterise a process redesign project:

a) Kaizen or breakthrough - A Kaizen-based improvement project is characterised by a plan-do-check-act approach while a breakthrough would scrap the existing processes.

b) Alignment with business strategy - The management of processes can consider or not, the general business strategy to inform its development.

c) Size and cross functionality - The project can encompass the whole business unit and, therefore be cross-functional, or be inter-functional and more limited.

d) Process architecture - A systematic approach necessary to define the relevant processes and to identify inefficiencies.

e) Leadership - Senior management can be involved in detailed operational levels.

f) Performance measurement and control - A project can use milestones and ratios in order to control the evolution of the process, or can be absent on these matters.

g) Change in improvement direction - The project can follow an incremental or 'strategic leaps' approach to develop capabilities along the same lines as the previous improvement trajectory followed by the firm, or attempt to alter such a trajectory.

h) Time frame considered - An organisation could only be temporally involved in the project, or commit itself to a long-term period.

i) Staff commitment - The level of credibility and commitment of staff personnel are relevant variables.

j) Information technology - IT can be regarded as the important issue in the project, or only an enabler.

3.7.5 TQM and BPR

The literature on quality distinguishes two types of projects: Breakthrough and Kaizen. Imai (1986) recognises the need for eventual innovations that should be supported by
continuous improvement. Innovation alone, he argues, would not be able to sustain the levels of performance and after a great improvement it would gradually decay. He suggests a dichotomy between Kaizen and innovation projects where the first has long term effects and relies on people, and the second has short-term effects and relies on technology.

BPR has a great deal in common with breakthrough projects in the quality literature. Indeed, Dixon et al. (1994) argue that Juran's conceptual project-orientated process of quality planning, control, and improvement aimed at achieving breakthrough improvement, is quite consistent with working definitions of reengineering.

Mukherjee and Jaikumar (1995) studied a quality award winner company that implemented both Kaizen and breakthrough projects. Kaizen projects are reportedly based on Plan-Do-Check-Act methodologies, led by foremen or supervisors, and are interdepartmental in scope. The problems they focused on were internal product failure and process capability, safety, housekeeping, ergonomics, maintenance, and productivity. The participants initially define the problem and set a goal. Then, issues that should be tackled are identified through discussion over the analysis of the data generated through the use of the seven statistical tools. Solutions are proposed and implemented, and the results are analysed, possibly leading to another cycle of refinement.

Breakthrough projects are interdepartmental and aim at major improvements. Here the structured method for problem solving given by TQM methodologies is of little use. As the authors explain:

In other words, well defined problem solving methods often do not exist, conflicting trade-offs have to be made, solutions cannot be recognised until they are reached and not all problem transformation and states are known. (ibid.)

According to Garvin (1994), both TQM and BPR movements suggest (a) the redesign of processes, using flow charts to show the steps of the process and identify inefficiencies
and (b) the use of senior managers as "process champions", to ensure integration and overcome functional orientation. However, while the quality movement (Kaizen) sees improvements as the result of incremental steps, BPR calls for radical change. TQM experts argue that for the improvement of existing processes, measurement and control are achieved by statistical tools, documentation, and the establishment of control points. Reengineering experts consider the existing process as ultimately useless and start to redesign from a blank page. As Garvin states: "They are virtually silent about measurement and control."

Dixon et al. (1994) conclude that the main difference between reengineering and continuous improvement process is not the commonly cited factors such as: project size, improvement rate, cross-functionality, IT role, top-down management. Instead, what truly differentiates both approaches is that reengineering projects involve "changing direction". Not only the processes are changed but also the direction of improvement. Reengineering projects may be necessary in order to break path-dependencies. Together both perspectives presented here can capture the dynamics of change experienced by the organisation's business processes which can be either evolutionary or radical in nature.

We can now present the cross sectional model that complements the longitudinal model. The intensity of the drivers of change vary at different points in time as the organisation moves from its initial conditions to its final state. This indicates that the importance and activity of the several drivers should vary along the process. After performing the case studies we should be able to understand these relationships better and refine the model.
3.8. Hypotheses

3.8.1. Research outline

Empirically the central issue of this research is to produce insights into the evolution of operational performance. The initial case was used to generate a model where initial conditions and the dimensions that drive the evolution of operational performance are considered. Constructs were built from the field study in the tradition of grounded research. Other cases are added in the next chapter in order to challenge and refine the initial model. By writing-up the four case studies based on the model initially proposed, we engage in theory building and theory testing (Leonard-Barton, 1990; Yin, 1984).

In this section, exploratory hypotheses are developed. Their aim is to shed light on specific aspects of the evolutionary process. They are designed to focus our attention on issues where the advice of different paradigms is conflicting or simply absent. The overall research was designed in order to take advantage of the two strong points of theory building through case study noted by Einsenhardt (1989). The first is to juxtapose
different, and often contradictory, views so that the likelihood of creative insights is increased. Second, the emergent model creates “constructs that can be readily measured”, because they are likely to have been measured during the first phase of theory building. We are also likely to have a “hypothesis that can be proven false” because the proposed theory is already produced in a way that it can be tested.

The criteria of sampling companies that had been awarded important recognition of their operational abilities were adopted as a safe way to sample companies which are more operationally effective than their competitors. But to be awarded a prize was a necessary but not a sufficient condition. Available benchmark indicators of operational performance (e.g., CIGNA takes 4 days to pay a claim when the average in the market is 14 days), customer perception (e.g., TNT increased customer loyalty dramatically), or business performance (e.g., SERASA multiplied several fold its output and revenue, while cutting price and keeping the same workforce) were also taken into consideration. An important fact is that all of the companies considered moved from losses into profit during the strategic process.

The cases offer an additional benefit of representing polar cases of the speed with which business processes were changed. This ranges from radical (CIGNA) to continuous (TNT and Toshiba) change, while considering an intermediary case (SERASA). The sites also differ in size. CIGNA and Toshiba (the air-conditioner plant) are small and TNT (the UK parcels division) and SERASA are relatively big companies.

3.8.2. Exploratory hypotheses

As it has been noted above, the hypotheses are designed to draw theory building from issues about which the branches of literature considered here are either vague or have competing points of view. Our hypotheses directly address the literature gaps, but the intention behind them is to focus the research on elements of the grounded model. The link with the literature gaps will be made indirectly. Data collection and analysis shaped by the hypotheses should produce the necessary factors to address the literature gaps.
Hypothesis 1: Strategic operational performance improvement requires the evolution of all initial conditions that hinder the evolutionary process.

In his study of projects in strategic alliances, Doz (1996) found that successful projects were those where the partners went through interactive cycles of learning, revaluation, and readjustment, while the failed projects were found to be highly inertial. The strategic processes were found to be determined neither exclusively by the implementation of initial objectives, nor by the initial conditions. This was better understood as a combination of the effects of the initial conditions and the learning process that allowed the partner organisations to act upon and adapt the initial conditions.

Closely related to the evolution of initial conditions is the Sanchez and Thomas' (1995) distinction between capability building and capability leveraging processes. Capability building leads to a qualitative internal change in the organisation, while capability leveraging refers to the expansion of the elements that already exist in the organisation. Thus there can be operational improvement based on capability leveraging, for instance resulting from the upgrading of equipment, but this is unlikely to provide an edge because capability leveraging alternatives are available to all competitors.

Because a quantitative change is not sufficient, there should be a qualitative change in the organisation. We link qualitative change to the evolution of initial conditions. A firm can only be considered to have changed qualitatively by the end of the strategic process when its initial conditions are significantly different. This hypothesis extends this notion by saying that the change should reach all initial conditions. The importance of the word "all" is central. It implies that change should occur in all dimensions of the firm. One of the implications is that operational performance improvement does not relate only to what happens on the shop floor. Instead, it may be dependent on other elements of the firm that have never been considered before.

Hypothesis 2: The relevant drivers of strategic operational performance improvement are (a) the organisational processes: co-ordination, entrepreneurship, and learning; (b) the
managerial processes: gap-closing, management style, senior management teamwork, performance control, and behaviour alignment; and (c) activities related to process control and redesign

This hypothesis tests the relevance of the elements of the model. A model that explains a process should be one in which variation in the state of its elements will affect the course and outcome of the process\textsuperscript{16}. The case studies and the within case analyses are organised to describe the relevance of each element of the model. In this way, they will automatically test the significance of each of the elements of the model. Because the model was defined through grounded research we should expect it to have a strong grounding on reality. However what is relevant to the pilot case may prove to have no significance in explaining other cases.

**Hypothesis 3: The drivers of strategic operational performance improvement are mutually dependent and supportive**

Beer and Eisenstat (1996) argue that a long stream of research has shown that hard and soft elements of the company must be aligned if managerial intervention is to succeed. Nevertheless, actual interventions tend to be uni-dimensional, because managers and consultants choose interventions that are consistent with their personal abilities or values. These interventions tend to fail because “harder” elements of technology, strategy, and structure are not aligned with softer elements such as people, values, and leaders. In their dynamic capability theory, Teece and Pisano (1994) are more specific and consider the need for achieving coherence between processes and systems as a prerequisite for performance. They argue that what may be regarded as the style of the organisation, is not really discretionary, but in fact encompasses elements that are necessary to achieve performance. They write:

\textsuperscript{16} In chapter 5 (micro-research)
Recognising the congruencies and complementarities among processes, and between processes and incentives, is critical to the understanding of the organisational capabilities.

The need to tune management processes, management systems, and organisational processes can be argued to be a possible explanatory cause of why many companies fail to reap benefits of top down implementation of TQM and re-engineering projects. Line workers may be given the tools and taught the principles of TQM, but if management does not change inappropriate patterns of behaviours and organisational systems, the programme is likely to fail.

Majchrzak and Wang (1996) studied organisations which had abandoned functional structures to create process complete departments. They concluded that managers spend most of their efforts redesigning the organisation but fail to rethink their own role and continue “to act like functional chiefs even though the functions no longer formally exist”. In cases where that was happening the units were under-performing as compared with those where managers have developed a collective sense of responsibility. Thus, it is reasonable to expect that the organisational processes at the bottom of the organisation are dependent on higher order managerial processes. Teece and Pisano write:

[findings in the literature] suggest that productive systems display high interdependency, and that it may not be possible to change one level without changing the others. This appears to be true with the ‘lean production’ model...

The learning literature also recognises the necessity for systems’ coherence. Fiol and Lyles (1985) see strategy, structure, and culture as interdependent elements in the creation of a learning organisation. Similarly, Senge argues that successful leaders, who create learning organisations, are systemic thinkers who are able to see interrelationships and processes, instead of things and snapshots. Leonard-Barton (1992b) also found that practices, values, and systems are mutually dependent on a delicate balance.
Hypothesis 4: Active organisational processes are a necessary condition to achieve strategic operational performance improvement.

We have proposed above that organisational behavioural processes can be understood in terms of co-ordination, entrepreneurship, and learning. Evidence from the literature (which is largely unconnected) substantiates the idea that these categories are linked to superior operational performance.

The MSM does not see any strategic importance in the contribution of shop floor individuals. An exception can be made with Hayes and Wheelwright (1984), who are closer to the lean production perspective, and argue that companies that achieve stage four are those that are committed to continuous improvement. Nevertheless, the role of individuals involved in continuously finding better ways of producing things, is fundamentally different from the strategic role given to organisational members in this research.

The lean production paradigm sees organisational members’ contribution to performance improvement in terms of continuous improvement activities. Similarly, the resource-based literature sees individuals contributing to the creation of capabilities by conducting search processes that will lead to organisational learning (Doz, 1994). The view here is different. We consider the search routines that lead to continuous improvement, in terms of process control activities. The important contribution goes beyond that and is fundamentally different in nature. The strategic contribution of organisational members to operational performance is to be found in ingrained behaviours that belong to the organisation. These intangible assets at the bottom of the organisation understood as learning, entrepreneurship, and co-ordination, determine the efficiency of tangible business processes. Therefore active organisational processes are a necessary condition for the firm’s business processes to deliver a differentiated outcome.
Thus, this hypothesis advocates that these processes are the key to achieving performance and explains the real contribution of organisational members towards the evolution of operational performance.

**Hypothesis 5: Leanness is a necessary outcome of the process of strategic operational performance improvement**

One of the key differences between strategic operational performance improvement and operational performance improvement is that the organisation should go leaner at the same time as its operational performance improves. For instance, it is possible for an organisation to become more flexible without becoming leaner. It may be a matter of assigning more resources to close the gap between current flexibility and desired flexibility. To be strategic, operational improvement has to be based on transformation which allows the organisation to use fewer resources while delivering an improved output.

Organisations use buffers to deal with speed and complexity (Galbraight, 1995). We see buffers as a wider concept than only the physical stock of raw material, WIP, or finished goods. Gittel (1995) argues that because the other airlines cannot count on developed co-ordination processes such as those exhibited by employees of Southwest, they have to rely on buffers such as increased staff and schedule turnaround time at the gate. This difference is the key to Southwest operational advantage. Gittel writes:

> **Southwest challenged the industry by providing inexpensive on time services with speed turnaround that increased aircraft utilization and lowered costs, assisted by superior co-ordination of the departure process.**

Superior organisational processes eliminate the need for buffers. However, as argued in hypothesis 3, superior processes are dependent on the evolution of compatible managerial processes. They may also depend on the redesign of business processes because superior
behavioural processes cannot result in superior performance when business processes are hopelessly inefficient.

A sequence of events leading to the desired strategic outcome of the development of an operational performance which is able to affect positively the competitiveness of the organisation has been proposed. It begins with the evolutionary adaptation of its initial conditions, and develops managerial processes that are systemically consistent. This allows behavioural processes to become very active, resulting in high performing business processes which will enable the organisation to shed its buffers.

This sequence of events is likely to be self-reinforcing. The elimination of buffers facilitates (or in some cases allows) the evolution of managerial processes because interrelationships become more visible and consequently more manageable. Organisational processes should also benefit because fewer buffers facilitate more and better interpersonal relationships.

In this chapter we have:

- Based on grounded research, proposed a model of the process through which organisations achieve improvement in operational performance, taking into account the process drivers and the initial conditions that hinder the process
- Defined the categories of organisational process and argued for the importance of their role in creating competitive advantage. We then defined the attributes of each process based on the literature and observations from the field.
- Defined the categories of managerial process in a similar fashion while emphasising the correspondence of each process to established areas of the literature
- Defined the role of process control and redesign. We also added the relevant literature review in the field which had not been covered in the first chapter
- Defined the exploratory hypotheses which are based on observations from grounded research and underpinned by elements of the literature
In the next chapter we define the appropriate methodology to test the proposed hypotheses. The following chapter presents the results from field study based on four companies. The case studies are organised in terms of the three drivers of operational evolution determined in this chapter, namely: managerial processes, organisational processes, and process control and redesign. This will allow us to test the exploratory hypotheses proposed above.

Infancy model
- some contribution
- was truly important...
Chapter 4 – Macro Research Framework

We begin this chapter by considering the implications to research design of a study aimed at identifying the origins of advantage. We speculate on the relevance of the division between research on process and content. We then identify the challenges that occur in process research, and consider the first major research design choice between qualitative and quantitative methods. We arrive at the decision tree that defines the research framework, after examining issues related to the overall objectives of the research and the epistemological view adopted.

Finally, validity and reliability issues that our research framework should be tested against are considered.
4.1. Introduction

The appropriate research methodology has to consider the idiosyncrasies and challenges of integrating literature traditions in strategic management and operations management, namely the resource-based theory and the manufacturing strategy and lean production paradigms. In the literature review we have discussed the incompatibilities of both literatures.

The resource-based literature (Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984; Lippman and Rumelt, 1982; Itami 1987; Barney, 1986; Dierickx and Cool, 1989; Teece, Pisano, and Schuen, 1990) has made a strong case for the importance of organisation specific production resources in driving competition. It has also found great acceptance among managers (Prahalad and Hamel). Because research has been mainly based on refutation-oriented large sample studies it has largely failed to produce managerial advice (Doz, 1994) for decisions regarding strategy in operations.

In contrast to the RBV which regards the soft aspect of the organisation as the only base on which to build sustainable advantages, the manufacturing regards it as of secondary importance. Authors such as Hayes and Wheelwright (1984), who address the soft side of strategy, do it in a way that is vague and problematic, on two counts: (a) They see the organisation in terms of structure and systems, and limit managerial intervention to content of strategy.(b) They regard the contribution of organisational members, apart from senior managers, in the evolution of operational abilities in terms of their participation in process control efforts, or in random processes of search and learning.

To adopt a view of the organisation in terms of its processes is an important step towards operationalising research that bridges the two perspectives (Garvin, 1994). By viewing the organisation in terms of a bundle of processes, instead of structures and systems, we can investigate the strategic importance of what managers do. This method is also a
vehicle for understanding the lower levels of the organisation as the locus of firm specific and not transferable advantage.

Business strategy literature theory about the origins of advantage and the relevance of the distinction between strategy process and content, has direct consequences for the macro-research design adopted in this research, and is discussed here. We then describe the characteristics of quantitative and qualitative research before defining the research design that is most appropriate for our research objectives. Finally, the chosen research design is tested against validity and reliability considerations.

4.2. The origins of advantage

This research is located within the field of operations management but it is also influenced by parallel discussions taking place in the broader field of strategic management. In parallel with the issue of evolution of operational performance considered here is the strategic management discussion of the origins of competitive advantage.

Porter (1991) believes that the answer to the question of how competitive advantages develop is to be found on two fronts. He suggests that the available literature is reasonably developed and can explain the particular causes of superior performance at a certain point in time. The “cross-sectional problem” addresses “what” constitutes a position of competitive advantage. It is mainly a static analysis which has to be separated from a dynamic one termed the “longitudinal problem” which examines “how” competitive positions are created. Before discussing Porter’s argument we should consider if there is any relevance in the dichotomy between content (“what”) and process (“how”).

4.2.1. The distinction between strategy content and process

In order to disentangle process and content we need to establish a connection between intention and outcome. If there were no connection between what is intended and the
outcome there would be no need for content. We should then consider the various perspectives of the strategy process in the literature because not all see a connection between strategy and outcome. According to Mintzberg (1990), managers base their actions on trial and error learning accumulated from their daily interaction with other organisational members and the environment.

An associated research stream which also focuses on the decision process is the Carnegie tradition developed by Cyert and March, and Simon (cited in Chakravarthy and Doz, 1992). It assumes a basic premise that managers wish to avoid uncertainties and search for new solutions only when they face problems. Schendel (1994) notes that to espouse the view that strategy emerges from daily activities of managers is to assume that managers “do not engage in a deliberate search process for strategy”, but instead it emerges from random and collective action. This leads to the conclusion that strategy “does not result from a perceived need for change”.

Schendel notes that shaping and implementing cannot be considered the same unless we share Mintzberg’s assumption that there is no connection between managerial intentional search process for strategy and outcomes. Good strategy, Schendel argues, requires ex-ante understanding of both “what” the elements of a winning position are, and “how” they should be achieved and sustained.

The answers to the “how” question, it is argued, are to be found in the working of organisational administrative processes. These processes shape strategy. Different processes are necessary to make use of the strategy. Therefore, there are different organisational processes concerned with finding, using, and executing the strategy. Schendel says:

*The strategy process sub-field is concerned with how effective strategies are shaped within the firm and then validated and implemented efficiently.* (Schendel, 1994)
Although in practical terms the consequences of the "what" questions certainly affect the "how", and vice-versa, it is concluded that we can consider the process of strategy as an independent research matter.

4.2.2. The challenges in process research

Porter suggests that the cross-sectional problem has been largely solved, and the success of organisations at a certain point in time can be explained by a privileged position in an attractive industry. The cross-sectional problem is alternatively explained in the RBV by the possession of organisation specific superior production resources. This debate was already addressed in chapter II and is therefore omitted here.

The longitudinal problem, it is argued, should be explained in terms of the dialectical interaction between managerial choices and initial conditions within a period of time. Whereas pure choice would "lead to the assembly or creation of the particular skills and resources required to carry out the new strategy", initial conditions in the form of reputation, skills, and in-place activities "clearly influence feasible choices as well as constrain them".

There are four principal issues that should be part of an explanation of the longitudinal problem: using frameworks or models, adopting qualitative or quantitative methods to test the theory, determining the appropriate chain of causality and the time frame involved. The first two are discussed here while the last two will be considered later on.

Initially one should choose between models which are mathematically rigorous but can only handle situations that are narrow and limited in complexity, and frameworks, which in turn, are able to deal with broader domains and encompass a bigger number of variables but are less mathematically rigorous.

"Frameworks" was the approach adopted in theory building in the field of strategy because it can inform practice. The practicality of frameworks comes from their ability to highlight variables that would otherwise be omitted by models, and to tackle the diversity
of competitive situations, the range of actually available strategic choices, and the unstable character of the main parameters. Knowledge, Porter argues, is embodied into strategy frameworks in many different ways:

...in the choice of included variables, the way variables are organised, the interaction among the variables, and the way in which alternative patterns of variables and company choices affect outcomes. (Porter, 1991)

Porter rules out the possibility of using statistical methods to test frameworks. He uses many in-depth case studies in his treatment of the cross sectional case as a means of specifying variables and exploring relationships between them, while controlling industry and firm specific approaches to strategic choices. He then concludes that the longitudinal problem cannot be approached by any other means than through the use of in depth-case studies to carry out empirical theory testing.

4.3. A distinction between qualitative and quantitative research methods

A number of issues highlight the distinction between quantity and quality in research. Three main dimensions are used here to characterise this distinction: (a) The nature of the involvement of the researcher, (b) the kind of data collected, (c) how generalisations are established.

The relationship of the researcher with the subject in quantitative research may be very superficial and brief or may not even happen. This is the case where the researcher relies on postal questionnaire survey or laboratory experiments. In contrast, qualitative research relies on interviews and possibly direct observation, and entails an extensive degree of personal involvement and interaction between interviewer and interviewee.

Consequently, whereas the researcher is an outsider in quantitative research, s/he should attempt to become an insider in qualitative designs because these designs demand an understanding of the perspective of those being researched. The researcher should
develop a sense of what is relevant and even the jargon used in the setting of the empirical research.

The objective is to allow the qualitative researcher to develop a greater awareness of what happens in reality (Glasser and Strauss, 1967) and to “weed out” those variables that do not. The researcher may even begin the study without identifying what the variables are. The reasons for adopting qualitative research thus support Porter’s (1991) justification of the superiority of frameworks over mathematical models as instruments of research into complex and little understood issues.

The kind of data collected is a direct consequence of the nature of the involvement of the researcher and the picture s/he attempts to build, whether considering limited variables under particular conditions, or understanding a greater number of factors and the relationships among them. The nature of involvement is therefore seen as the key issue which differentiates both styles of research (Bryman, 1989).

Whereas quantitative data is described as “hard, rigorous, and reliable”, qualitative data is described as “rich”. These different adjectives highlight the different nature of data collection. Quantitative researchers are concerned with identifying systematic procedures that can be readily checked and used by other researchers interested in replicating the research. However, qualitative research makes use of greater contact with the object of research to create a more complex picture of the interrelations that are involved.

Quantitative researchers have their research design defined before the first interview. They know which kind of data has to be collected in order to test the proposed theory. Conversely qualitative researchers often engage in a lot of preliminary fieldwork before they define an appropriate research design. Qualitative researchers are even encouraged to keep their research strategy open early in the field study because exposure to data may help them to refine the theoretical research framework.
A quantitative approach assumes a theory from which we can derive an explanation about a certain phenomenon. Hypotheses are formulated from the theory in a way that they can be tested. The results of the tests are indicative of the validity of the theory as well as standing as isolated knowledge of the phenomenon studied. Qualitative data is only knowledge when inserted into a theoretical framework.

Quantitative and qualitative research correspond to a dichotomy between nomothetic and ideographic modes of reasoning (Tsoukas, 1989). The former approach reflects an effort to establish generalisations that are independent of the place and time of the research, while the latter places its findings in the context of specific time and place. Nevertheless it should be noted that, in practice, quantitative research normally fails to have unrestricted generalisation whereas qualitative research can be designed with the objective of enhancing generalisability.

4.4. Choosing the research design

Any research aimed at understanding how advantages based on “invisible assets” are developed, is faced with an obvious problem: ambiguity. The sustainability of competitive advantage depends on three factors: (a) environment change which can make that specific advantage obsolete, (b) availability of substitutes (c) the inimitability of the development process (Peteraf, 1993).

Hypotheses (a) and (b) are unlikely to happen in cases in which advantage is based on perceived superior operational performance (e.g., higher quality of service, or flexibility of response to customers’ demand for manufacturing). Then, the sustainability of advantage is largely dependent on how observable is the process through which inputs are transformed into a superior outcome. Considering inputs and the process to be identifiable, is to consider that advantage depends solely on the availability of the inputs in perfect markets. Therefore, if the same resources are available to all organisations, we cannot explain performance heterogeneity among firms.
The resource view adopted in this research assumes that the causes of advantage are essentially unobservable and ambiguous. It suggests that the research objective here cannot be aimed at building a normative theory of how to develop outstanding operational performance. Instead our goal should be to provide insights into the process of evolution of outstanding operational performance by creating a dynamic framework of the drivers of this process. In their investigation of strategic change and competition Pettigrew and Whipp (1991) argue that:

The process of strategic change is not likened to a linear, sequential assembly line of investigation, choice and implementation. In practice knowledge, decisions and actions are simultaneously linked.

Our definition of this research has led us away from a traditional view of the organisations as structure and systems. If we were to explain the evolution of operational abilities as determined by managerial choices of structure and systems, and by the acquisition of external resources, then such changes could be observable and readily imitable.

But the process of evolution depends on factors that are closely parallel to Reed and DeFillippi's (1990) description of invisible resources which are tacit, diffused through the organisation, and/or socially embedded. Operational advantage, according to the model presented in this research, emerges from the action and interaction of managerial processes and systems, organisational processes, and the control and redesign of work processes.

We would not be able to prescribe through a 'grand' theory how organisations should proceed in order to develop superior abilities because cause and effect relationships are not observable. The ambiguity problem inherent in this research highlights the impossibility of establishing causal links between identifiable inputs and superior outcomes.
Research which does not set out to determine causal linkages needs to be positioned in the debate between positivists, who consider this kind of research as a tool for making predictions, and realists, who acknowledge that it might inform us about the deeper nature of reality. This discussion has clear implications for theory testing.

In this section we select our research design in terms of its consistency with the objectives of the research and the epistemological view espoused. In the next section the capacity of the chosen design to resist logical tests of validity and reliability is assessed.

4.4.1. Implications of unobservables to theory testing

Because we cannot empirically observe cause and effect relationships in this research we are led away from a positivist view of science. Below, we summarise the principal approaches and argue that Popper's approach to theory testing is the most suitable for this research.

The central idea in positivism is that, in order to be meaningful, a theory must be empirically observable. A direct consequence of this idea is that knowledge is only advanced when a theoretical proposition can be verified by an empirical observation. It draws the line between what positivists regard as science and what they do not. The emergence of a number of well established theories such as Quantum mechanics, which defies empirical observation, forced positivists into a more flexible position (instrumentalism, DN model) while remaining sceptical about the ability of these theories to tell us something about reality.

The basic difference between a realist and a positivist view of science is that the former is willing, under certain conditions, to accept the existence of unobservable elements whereas the latter would regard a theory based on unobservable elements as non-scientific, or at the most, as a useful explanation tool. Realists argue that all modern scientific endeavour is based on theories that contain unobservable elements, and if we consider them to be metaphysical, we are considering all progress made by technological knowledge to be a product of metaphysical theories.
Realists assume that we should treat those theories that are ‘approximately true as if they were true’. A theory is true if it is able to explain a set of phenomena better than others. The wider the range of phenomena that it can explain the more reasons we have to believe that it is true. The coincidence argument is explained by Godfrey and Hill (1995) as follows: “It would be an absurd coincidence indeed if a variety of different kinds of phenomena were all explained by a particular theory, and yet that theory were not true.”

The realists have abandoned the formal theory of truth, which assesses a proposition by its syllogistic form, in favour of assessing whether a proposition corresponds to the real world or not. In this sense, Popper’s (1972) “common sense approach to knowledge” argues that the truth about theories which are based on elements that cannot be observed, is dependent on standing up to repeated attempts to falsify it. Although we can never be absolutely sure about the propositions, they remain true until they can be proven false.

We test the theory proposed here using Popper’s approach by attempting to falsify the initial hypothesis. The sampled companies are of different sizes, trade in different industries and, above all, have undergone processes of change that vary in their degree of transformation. The sample was designed to extend the range of phenomena that the theory sets out to justify thus improving the chances of refutation of the hypotheses. If the theory stands the test, we have more reasons to believe that it corresponds to reality than we would have by sampling similar companies.

Our adoption of a realist position is not common in operations management research. The field of operations has hardly recognised unobservable factors as relevant to the development of theories in the field. This is not surprising if we consider that it has its roots in the scientific management of the factory and is in many ways close to engineering. The manufacturing strategy framework is about identifying desirable outcomes and gathering necessary structural inputs. Thus the manufacturing strategy paradigm expects clear causal linkages among structural changes, infrastructural decisions and the desired outcome.
The new paradigm of competitive advantage leads to the recognition that the infrastructural side of strategy is more important than the structural one in creating competitive advantage (Hayes and Pisano, 1995). Cause and effect relationships in infrastructure cannot be observed as easily as in structural terms. This suggests that a realist view is more appropriate than a positivist one.

4.4.2. Choosing between qualitative and quantitative methods

The objective of this research is to shed light on the intra-firm mechanisms that allow firms to develop operational performance differentiation. This parallels the strategic management debate over the origins of advantage. It has been stated earlier that Porter (1991) sees the debate over competitive advantage as two different problems: the “cross-section problem” and the “longitudinal problem”.

The longitudinal problem is concerned with “how” outcomes are achieved, and constitutes the focus of this research. In order to investigate the “how” question we need to open the “black box” of the firm. This research addresses the way in which strategy is shaped, validated, and implemented. Consequently, unlike content researchers, process researchers cannot afford to keep a distance from the actual processes which perform these three activities.

Considering the need for involvement of the researcher, together with the basic characteristics of quantitative and qualitative research methods, we can conclude that qualitative methods are a more appropriate choice. Bryman (1989) proposes four important research designs. Because the objectives of this research exclude quantitative methods, the use of a survey research is considered incompatible with the objectives of this research.

There are three qualitative modalities of research: Experimental research, action research, and case study research (Bryman, ibid.). Experimental research presupposes that the researcher is able to interfere with the independent variables and observe the effect that
they have on the dependent variables. This is clearly misconceived, because dependent variables such as management behaviour or techniques of process control (which were defined during the field research) cannot be controlled by the researcher. Also, the data is collected *ex-post* to events.

In action research the participation of the researcher goes beyond that of observer and data collector. S/he also advises the organisation on possible lines of action. The research includes observations of the effect of the researcher’s suggestions on the organisational problem that is being examined. This is clearly not the case with exploratory research in which the concepts are initially little understood by the researcher. In addition, action research presupposes that the research cannot be undertaken when the events have already taken place.

Therefore we are left with only one research methodology appropriate for the investigation of the evolution of operational performance. This is case study research. It has the advantage of facilitating a study of events where the research depends on the participants' perception of reality and where s/he has little or no control over the process. It gives the researcher the opportunity to be involved in reality, which particularly suits theory building, especially in cases where previous knowledge is limited (Eisenhardt, 1989).

4.4.3. Chain of causality

Two challenges to the study of the “longitudinal problem” identified by Porter refer to the definition of a chain of causality and the appropriate time horizon that the research should consider retrospectively. Given that the evolutionary process should be understood in terms of initial conditions and managerial choices, the adoption of a starting point that is a long way back in the chain of causality may cause some of the initial conditions to become managerial choices. This can render the problem intractable. On the other hand, considering events late in the process may jeopardise the research results.
In this research, watershed events were chosen to determine the starting points in a chain of causality that could be studied. Ten years was also considered to be a time limit as beyond that, managers and workers would not be able to recollect and make sense of actions and events that could have influenced the process.

4.4.4. Number of cases

According to Yin (1994), case studies can be designed to involve single or multiple cases. He argues that a fundamental choice must be made between single and multiple cases before any attempts are made to collect data. Using the same rationale as the one that justified single experiments, single cases may be appropriate in specific circumstances: (a) In cases where the theory is well established and has specified the circumstances under which the propositions are assumed to be true (a single critical case which meets all the conditions foreseen by the theory may be a useful way to challenge and extend the theory), (b) in rare cases which represent extreme or unique cases, (c) and in revelatory cases that have never been considered in the theory. A more complex design is justifiable when there are sub-units of analysis that can be incorporated, because single cases can be enhanced by the adoption of embedded cases.

The weakness of single case research is that there is little opportunity for challenging the initial framework. Single case research is not therefore appropriate for this research study.

A central consideration in multiple-case designs is which sites to select. The choice of case study sites should not follow a “sampling logic” but instead a “replication logic”. “Sampling logic” requires the use of statistical procedures to select a specific subset of the overall population to be surveyed. The resulting data is assumed to represent the entire population within confidence intervals. In contrast, "replication logic" is based on a rich theoretical framework that can predict the conditions of a phenomenon.
The number of cases selected will depend on the particularities of the research. It is important to consider the disparities between the competing theories. If these are subtle a bigger number of cases may be necessary. If there is huge disparities between the explanations provided by the rival theories then a lower number of cases is sufficient.

The decision tree sums up the key decisions that have defined the overall shape of the research design.

<table>
<thead>
<tr>
<th>Theoretical framework</th>
<th>Theory testing modality</th>
<th>Specific technique</th>
<th>Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Framework</td>
<td>Quantitative</td>
<td>Experimental Action research Case-study</td>
<td>Single Multiple</td>
</tr>
<tr>
<td>Model Framework</td>
<td>Qualitative</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.1 Research design decision tree

Because the theories considered here (the resource-based theory, manufacturing strategy, and lean production) do not provide clear cut contrasting explanations for the phenomenon, we opt for the maximum possible number of cases, considering the depth of analysis and the constraints of Ph.D. research. We judge that the appropriate number of cases should be four. Some of the key issues that contributed to the shape of the research design are:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambiguity</td>
<td>Impossibility of establishing causal links. Need for realist view</td>
</tr>
<tr>
<td>Theory testing</td>
<td>Popper’s “common sense approach to knowledge”</td>
</tr>
<tr>
<td>Chain of causality</td>
<td>Careful definition of initial point to avoid exogenous variables to become endogenous and vice-versa.</td>
</tr>
<tr>
<td>Number of cases</td>
<td>Four. As theories are not strikingly contrasting we consider as many cases as it is recommendable in in-depth case study research</td>
</tr>
</tbody>
</table>

Table 4.1 - Issues involved in research design
emergent theory, or they may be chosen to fill theoretical categories and provide examples of polar types”.

This research used grounded research in one initial case to define the research hypothesis and then selected cases that were likely to predict similar results. The companies had in common the fact that they had been through a process in which their operational performance had dramatically increased and they showed a number of indications that they had actually achieved differentiation at the operational level which had given them a competitive advantage over their competitors. This is discussed in more depth under sampling.

The patterns observed in the grounded research phase were expected to be repeated in all other cases. Given that all cases turned out as predicted, the initial propositions could then claim support from the evidence and the resulting framework was able to state the conditions under which the phenomenon was likely to occur.

Apart from demonstrating its validity, a study should also be reliable. This means that all the steps of the research should be demonstrated to be replicable by other researchers to produce the same results.

The quantitative part of the research does not have reliability problems as other researchers can use the questionnaires. The questionnaires used in this research are presented in the appendix.

The qualitative interviews did not follow protocol for reasons that we have already explained. However they followed clearly defined lines of questioning. The questions were formulated to reveal variations in the state of the variables. In the next chapter we explain how we defined very carefully what we meant by process. It reinforces the fact that another researcher would obtain the same answers. All interviews were tape recorded and transcripted in full.
In this chapter we have:

(a) Considered the challenges and particularities of research aimed at understanding how advantage evolves
(b) Defined the decision tree that leads to our macro research framework
(c) Confronted the chosen framework with validity and reliability criteria

In the next chapter we define the micro-research design.
In this chapter we explain the micro research design. We begin by describing the sample companies and explain how grounded research was used to build our research model. The data collection in this research involved both quantitative and qualitative methods. Because qualitative data collection was not based on rigid questionnaires, the meaning of process and the adopted theory of process are discussed. We then describe the actual steps taken during the qualitative data collection phase. Quantitative data collection involves the design of the questionnaire and statistical tests to ensure the scale’s validity and reliability.

From data collection we move to data analysis. Explanation building was the chosen analytic strategy. We discuss why explanation is built in terms of relationships instead of cause and effect explanations, and define the analytical focus and the goals of the research respectively as outcomes and prediction. We close the chapter by describing how case studies were used to treat the data.
5.1. Defining the micro-research design

We concluded in the previous section that the most suitable macro research design was qualitative and based on multiple case studies. In this section we analyse the choices involved in determining the micro research design. We explain how the sample was defined, how grounded research was used, and how quantitative and qualitative data were collected, analysed and treated.

Research goals are defined in terms of three objectives, to provide: (a) description, (b) theory testing, and (c) theory building. Definition of the research in terms of one of these goals has direct consequences for the research design. Description of the phenomenon only would be unsatisfactory while theory testing is not an available alternative because the constructs are ill defined. Thus theory building is adopted here as a research goal, of which the final product is a conceptual framework (Eisenhardt, ibid.).

In the previous chapter we adopted a realist view and discarded theory testing in terms of observable causal relationships. Consequently we have to discuss the validity of scientific claims grounded in a realist proposition based on “adequate explanation” of the phenomenon and its consequences for theory testing. Finally, necessary choices in terms of analytical focus and research goals help to define the approach to data treatment.

In sum, this research is essentially an interactive one between data and analysis, as is normally the case with case study research aimed at theory building. It attempts to profit from the strengths of this modality of research which are defined by Eisenhardt as: (a) the juxtaposition of contradictory and paradoxical evidence and literature in order to unfreeze thinking, (b) the generation of constructs that can be measured and hypotheses that can be proven false, which are specially suitable for a realist view adopted here and (c) the likelihood that the method is valid because the research was built on a tight iterative process with field evidence generated by grounded research.
5.2. The sample

The key sampling criterion was that a selected company would have undergone a process in which its operational performance was improved at a rate that would be enough to alter the competitive position of the firm. Indeed the cases selected here all have dramatic ratings of improvement and their current competitive position is radically different from the point where they had started the strategic process.

It is our intention to argue that these companies developed differentiation in terms of operational performance. In some cases there is objective evidence that key processes, such as claim turn around time for a health insurer like CIGNA, have considerably superior performance ratings than their industries' overall standard. In other cases, where benchmark data were not available, other evidence indicates that the company enjoyed a position of advantage. We then can argue that this newly found position of advantage is due to operational performance improvement because the industry structure has hardly been altered since the beginning of the strategic process.

To ensure that we could find companies with the desirable characteristics we decided to select them from among those which had been given prestigious awards. This is a further indication that these companies had an edge in their industries. CIGNA Health Care was the 1995 national award winner for Service Excellence, and TNT received the 1995 and 1996 European Quality Award Prizes in addition to the UK Quality Award in 1994. The Toshiba air-conditioner plant in Plymouth was awarded the 1996 prize for the best manufacturing plant in their industry. Finally, SERASA was the winner of the Brazilian National Quality Award (PNQ) in 1995.

Thus these companies have in common a dramatic improvement in their operational performance and consequent market expansion. The average price of SERASA's main product fell by 52 percent while the lead time fell from 27 days to 7. There are plans to reduce it to one day by the end of 1998. The quality improvement of its interface with customers was reported to be dramatic.
The strong customer orientation, attested by the national quality award which SERASA received in 1995, did not exist when the company was producing only for the captive market of its shareholders. The market expansion achieved by the company resulted in a jump from a little more than 500 clients to more than 14000. The company also boasts an increase from 7 millions to 70 millions in the amount of information supplied, with the same basic human and physical resources.

The medical costs for CIGNA's clients have increased at a rate far below inflation in medical care in the UK, without sacrificing the quality of treatment given to the customer. Claim turnaround time is down from 15 to 4 days, quality rose 55 percent, service level is up by 52 percent, new business quoting time was reduced from 17 to 2 days, savings of 870 million pounds were achieved in the first two years of the implementation of a team structure.

TNT evolved from a situation of crisis in which it could retain only 8 percent of its new clients, to a completely different competitive position. Now, about 99 percent of deliveries are on time even considering circumstances beyond TNT's control such as the weather, which is unlikely to be matched by its competitors because customers' surveys consistently rate TNT as the most reliable for parcel delivery. None of its 20 major clients have defected in the last three years and 16 of them have been trading with TNT for more than five years. In the meantime, revenue has grown from £144 million to £230 million since 1993.

Toshiba started from scratch and achieved quality levels on a par with its Japanese mother plant and very competitive cost levels. Since November 1991, production has grown more than 400 percent with an increase of the workforce from 120 to 290 employees. In the last 12 months, productivity has grown by 40 percent with little capital investment. The best factory award earned by the company in 1995 was awarded on the basis that the company presented an operational performance superior to its competitors.
Day and Wensley (1988) see positional advantages in terms of superior customer value and/or lower relative costs which lead to performance outcomes indicators such as satisfaction, loyalty, market share, and profitability. Whereas market share and profitability may be affected by other factors, such as the structure of the industry and past performance, loyalty and customer satisfaction are more sensitive to current operational performance.

Customers would not be loyal to an unreliable service or a poor quality product. The fact that the companies in our case studies have very high rates of customer satisfaction and very low rate of customer defection are strong indications of the existence of a competitive edge. Also the companies studied have had their profit and market share significantly increased since the beginning of the process with cases of very strong market expansion. The final indication already cited above, is the prestigious awards linked to operational excellency that they have received.

5.3. Defining the theoretical framework - grounded research

As the constructs could not be defined prior to the beginning of the field work, we made use of the grounded theory research (Glasser and Strauss, 1967) to identify the relevant factors involved in the evolution of operational performance which are the independent variables in this research. Successful evolution of outstanding operational performance was defined as the dependent variable.

Initially a questionnaire was developed to be used as a reference to open-ended interviews in the first organisation. Managerial and organisational processes were only vaguely defined at this stage. Initial data collection forced us to rethink and reshape our typology of managerial processes. Evidence also uncovered the need to add a category independent from managerial processes which referred to the ways the organisation interfered with its business processes.
A number of pre-concepts that were implicit in the literature or which we thought were reasonable hypotheses had to be discarded in the first contacts with field reality because no correspondence was found with reality. The link between the perception of operational strengths and marketing actions, bottom up drivers as the main variables in the evolution of operational performance, and a direct relationship between the evolution of performance and climbing to higher stages of knowledge are some examples of issues that we discarded.

The grounded research also served to identify the relevant organisational processes. As expected, it was found that co-ordination and learning were important dimensions of the intangible processes that were supportive of business processes. It was also found that both managers and workers regarded entrepreneurship understood in terms of specific categories of spontaneous beneficial behaviour as an important factor to explain performance evolution.

It also revealed the need to differentiate between the ability of completing the learning cycle successfully and problem spotting and solving. Both are facets of learning but problem spotting and solving are regarded by us as a part of process control activities and therefore distinguished from learning as organisational processes.

To sum up, from the data of the first case grounded theory was the key to identifying and defining the meaning of the constructs which make up the theoretical framework. Lyles and Mitroff (1980) describe the technique:

Grounded theory (Glasser and Strauss, 1967) is a process for conducting research that attempts to start with an initial guide to collecting and verifying data but allows the researcher to be aware of other contingencies that will affect the original hypothesis. Hence, the theory is grounded on the data but is not rigidly bound to it and the researcher can go beyond the original plan and original theory. Grounded theory is particularly useful for exploratory research where you cannot have a rigid and well connected experimental design.
5.4. Data collection methods

Case studies can combine a number of different sources and tap into both qualitative and quantitative evidence. Archives, interviews, and observation are examples of qualitative research whilst survey questionnaires are examples of quantitative research. Yin (1994) argues that case studies can profit from quantitative methods, which can yield a synergistic relationship. This is because quantitative methods can uncover relationships that are invisible to the researcher and challenge his/her observations. This results in better defined constructs and hypotheses.

Survey research was not used in the strict sense of triangulation because it cannot focus on the same issues as the open-ended interviews. The quantitative method was used to gather information on the patterns of behaviour of front line workers. It was complemented by a number of open-ended interviews with workers and also observations.

The quantitative measurement of the dependency category (how dependent was one’s task or the tasks executed by other members) provided triangulation with direct observations of the leaness of the production systems and thus helped cross checking for internal validity (Jick, 1979). Data collection by the different methods was largely parallel but nonetheless allowed more confidence in the results.

The qualitative data collection was informed in broad terms by the definition of what we meant for process and a theory of process, as discussed by Van de Ven. The choices involved are explained below.

5.5. Qualitative data collection

Above we have concluded that our research question has to be answered through a study of the strategy process. But the meaning of process is not as straightforward as it appears at a first glance. Van de Ven (1992) suggests that very different views of process are
adopted in the literature and they depend on implicit assumptions made by authors. Different assumptions, he argues, result not only in different views but also in different questions to be asked.

He then suggests a typology of the process meanings commonly used in the literature: (a) explanation for variance theory, (b) category of concepts, and (c) developmental event sequence. How we conduct the interviews should not be informed only by a clear understanding of process but also by the explanation logic that underpins our view of the process.

5.5.1. The meaning of process

The first category attempts to explain the model input-process-sequence in terms of a causal relationship between inputs and their outcome. It is suggested that, typically, a number of "restrictive and unrealistic" assumptions about the order and sequence of organisational events may be made in order to support the explanation. This kind of research does not open the 'black box' in order to observe processes directly. Instead it relies on building a logic that can satisfactorily link inputs to outputs, and therefore it is unsuitable for the nature of our research.

Another category sees process in terms of a sequence of events that explains the evolution of events over time. Van de Ven considers it to be the least understood of the three categories. Instead of examining changes in the variables over time, as is usually the case with process research, its description is not based on variables but on stages, activities, or incidents that can describe the process in a historical perspective. Although this kind of research is suitable for longitudinal studies that suggest their models through induction, it is unsuitable for our case because one of the central propositions of this research is to identify the variables that are responsible for operational improvement.

A third category refers to process in terms of a category of concepts linked to actions of individuals and organisations. It is the most common meaning of process. It uses concepts such as communication frequency, work flows, and decision making techniques,
which are operationalised as constructs that are measured as variables. The variables have only one pattern of action which means that they can vary from low to high. This view of process can only measure the different values of the variable at different points in time but cannot explain what caused the variance. This is the view adopted in this research.

5.5.2. The theory of process

Van de Ven widely researched disciplines as diverse as biology and geography in search of explanations for change process. The result was four basic families which represent basic explanations logic or “underlying generative mechanisms or laws” that describe a particular sequence of events in function of existing determined contingencies. The schools are: Life cycle, teleology, dialectic and evolution. Each of them deserves a detailed examination.

Life cycle theory argues that the initial stage of the organisation contains a set of rules or genetic code that will guide the development of the organisation through several development stages. The characteristics of the initial stage undergo a process where each stage presupposes the other and in which they progressively evolve from being homogeneous and simple towards becoming differentiated and complex. Although the external environment may play a role in defining the process the final outcome is largely determined by the organisational genetic code.

The evolution process theory is more than just another process perspective and constitutes a school of management thinking. Authors that share this perspective are divided into Darwinists, who argue that traits can be inherited only through intergenerational processes (Hannan and Freeman, 1977; Nelson and Winter, 1982); and Lamarkians, who argue that it is possible to acquire traits within one generation. The progress of the theory to date has not favoured the Darwinist view and has failed to operationalise a line of research which is able to demonstrate the mechanisms of organisation generation produce a vehicle for intergenerational transmission. Empirical evidences favour the Lamarkian view where organisations learn and imitate.
The process of change is determined by three drivers: (a) variation, the creation of new organisms by chance; (b) selection, the survival of the fittest; and (c) retention, the inertial force that opposes variation and selection and works towards retaining the existing species. As Van de Ven (1992) puts it, "evolution explains change as a recurrent, cumulative, and probabilistic progression of variation, selection, and retention."

Teleology process theory represents the approach of strategic planning of the classical school of strategy. It assumes that organisations are pursuing purpose and will go through adaptive phases to reach that goal. Similar to manufacturing strategy, the organisation chooses a goal and then selects from a range of alternatives a route best suited to achieving that goal. This selection process is what differentiates teleology from life cycle theory. Life cycle theory advocates a "one best way". Its progress towards the rest state can be observed because we know what the end state is. After reaching a resting stage, external or internal contingencies may launch the organisation into a new process of evolution.

The dialectic process theory sees the process happening in a world where competing forces, values, and events struggle among themselves for domination. Conflict may arise from internal factors such as conflicting goals or rules of development or may be external to the organisation where it conflicts with other entities. This theory recognises and admits stages of stability where competing forces are balanced and the status quo is then maintained among the competing parts. When, for some reason, an unbalance arises a new dynamic process is created. The specific patterns chosen to solve or mediate this imbalance of forces will determine one of the three possible final stages: equilibrium, oscillation between opposites, and moving away from equilibrium into a process of revolutionary change.

All families of the theories described above share the fact that they are composed of three distinct stages: defined starting conditions, emergent process of change, and a functional end point. However the theories emphasise different aspects. Dialectical and evolutionary theories concentrate on the change process; life cycle theory concentrates on the initial
conditions, and teleological theories concentrate on the functional end or final goals of the change process. Life cycle and teleological theory are predictive theories because they acknowledge the necessary evolutorial stages, while dialectical and evolutionary theories cannot predict results but provide us with constructs to understand the process of change and evolution.

We consider two facts to choose our view of process: (a) grounded research revealed that senior management engaged in a search for desirable end states, and (b) Porter's proposition that the process of evolution has to be understood as a dialectical process between initial conditions and managerial choices. Thus, one school of thought in isolation cannot represent our view of the process and we have chosen one that combines the predictive characteristics of teleological theory and the dialectical view.

5.5.3. Data collection

By the second stage of the data collection which followed the grounded research phase, we had already defined the main elements of the theoretical framework. We then returned to the first site, CIGNA, to conduct another set of interviews with management and also to distribute the questionnaires for the line workers to complete.

The next step was to decide who should be interviewed. Like other cases CIGNA was a case in which the evolutionary processes had been completed because the independent variables were either already steady or changing very little. The basic criterion was to select managers who had been in the company since the initial point of the process, or who had arrived shortly after.

In order to set the criteria it was necessary to consider the exact starting point. Porter (1991) calls attention to the importance of defining the time frame, because variables which are considered indogeneous in the long term, may be considered exogenous within a shorter time span. In cases considered here, the starting points are quite evident.
In the case of CIGNA the starting point was the shutting down of the English facilities and transfer of operations to Scotland. TNT's starting point was the crisis faced by the company in the aftermath of the 1988 postal strike, which almost paralysed its operations. Toshiba's process began when the micro oven plant was shut down and to give way to the air-con manufacturing. SERASA's turnaround process began when the management team was removed to make way to the new CEO appointed by the shareholders.

Middle managers were selected using the criteria that they had already been in that position function for a relevant period of time. Exceptions were made when information on specific issues was lacking, such as process control. Middle managers were important because they could contribute an independent perception of senior managers' processes as well as their own processes. Where necessary, a number of team leaders were also interviewed to collect more information on issues that had been left incomplete by managers. In sites that had been through re-engineering projects we talked with one of the middle managers directly involved with the re-engineering project.

Prior to interviews, the available archival data were requested. Because the organisations were award winners, case studies and other articles were obtainable. Although not always of academic standard, this material was important to identify a road map prior to the interviews and allowed more time for specific questions.

The foci of the interviews were the individual's first hand experience with the change process, their initial feelings, direct participation and role, understanding of and commitment to the transformation of the organisation and of the production process. The questions also stressed their interaction with other actors from the same and other hierarchical levels. Interviewees were also asked to single out the events that they had found the most important and to describe them in detail.

A typical interview would include one phase in which the interviewee was asked to recollect what had happened during the whole period. The intention was to develop a general understanding of events and of different perceptions and feelings about them.
Some questions would direct the interviewees to comment on the effects of initial conditions already identified and to unveil other categories of initial conditions.

The questions of the second phase reflected our adopted meaning of process and focused on the variations of the variables identified during the grounded research. Thus, the questions were aimed at uncovering variations in those processes over time. Questions could not follow a set protocol because they had to be adapted to the particularities of each case and were contingent on the answers obtained during the interview.

Archival data and/or previous interviews were used to refresh the interviewees' memories and perceptions in order to avoid potential selective retrospective bias (Doz, 1996). The processes were divided into distinctive phases in order to avoid confusion or the concentration of the interview on only one specific time. It was also useful in the sense that the participants could compare different phases and define alterations in behaviour.

SERASA and TNT sites are geographically scattered over the whole national territory of Brazil and the UK respectively, which made it impossible to track the events in these branches. A trade off was made to concentrate only on the heart of the operations which was at the headquarters. In TNT's case that meant receiving parcels from the depots, sorting them overnight and sending them back to the delivering depots. In SERASA's case it meant the collection of documents sent from the branches and the producing of reports and financial analysis.

Interviews were always performed on site. There were at least two visits to each site. Plymouth and Greenock were sites, which we visited. We spent 4 days collecting data in each site. Each managerial interview would last two hours on average, although some were allowed to last a bit longer. Interviews with other members of the organisation would average about one hour. On each visit, a considerable amount of archival data was also collected.
5.6. Quantitative data collection

Quantitative research paralleled the qualitative data collection described above. A survey questionnaire was sent out to be filled in by line employees and team members. The questionnaire was designed to measure the intensity of certain bottom process behaviours. Interviews were used to measure management processes while survey data were used to measure organisational processes.

Although we used different data sources they were not solely aimed at corroborating the same phenomenon. There were overlaps. The leanness of production systems, for instance, was evaluated in terms of qualitative (open-ended interviews) and quantitative (survey question on dependency) measures.

5.6.1. Questionnaire design

As described above the categories of behaviour were identified in the grounded research phase when the dimension of entrepreneur behaviour was added to co-ordination and learning. Also in this phase, a number of workers were interviewed in order to eliminate those items from the item pools that described the behaviours, which although grounded in the literature had no connection with the reality of the workers' routine work.

Before formulating the wording for the questions we had to decide if we were designing a descriptive or an analytical survey. Analytical surveys attempt to uncover a causality relationship which can vary from a simple mono-causal “A leads to B” relationship, to complex multi-causal models where several causal factors may be interdependent. In our case, there was no attempt to establish a causal relationship or explain anything.

Rather, this research aimed only to measure the intensity of categories of behaviour by asking people how often they observed those particular behaviours occurring in their daily activities. As Oppenheim (1992) explained it: “The job of such survey is essentially fact finding and descriptive, it cannot answer the why question”. Therefore it is important
to note that from this data we cannot establish the causes underlying these categories of behaviour.

We attempted to minimise the risks to validity and reliability of the scale posed by careless wording of the questions. Inappropriate wording of questions and questionnaire constructions are the usual causes of weak validity, but in the case of factual questions this is not as important as in attitude questions, because what we are measuring is not within the respondent. Instead, the respondent is instead an observer of an external phenomenon which we want to understand.

The problems of validity may be intensified if the object of the question is not clear to the respondent (Oppenheim, ibid.). Our questions about the degree of change of the behaviour in question and the difficulty of implementing that change, are endangered by the fact that respondents have to compare actual behaviour with recollections of past behaviour which may not be immediately apparent to them.

The reliability of factual questions may suffer from the fact that people may be poor descriptors of their behaviour, providing answers in line with wishful thinking rather than relating what had really happened.

A scale needs to have a single underlying continuum, and thus we can determine a scaling approach which ensures linearity and uni-dimensionality. If the scale adopted is considered linear then we can treat the scores as integers and apply statistical techniques used to analyse interval-type scales, such as: mean, variance, standard deviation, analyses of variance, correlation coefficients and so on. Similarly statistical significance tests, such as t-tests and F-tests, can also be applied. The use of a Likert scale satisfies these conditions.

Questions were formulated to be answered from one to five according to the Linkert scale. In the Likert scale, respondents place themselves in an attitude continuum which
runs from 'strongly agree' to 'agree', 'uncertain', 'disagree' and 'strongly disagree'. For scoring purposes these positions are given weights of 5, 4, 3, 2, 1.

Similarly, in this research we made a statement about a particular behaviour and asked the respondent to answer how frequently that organisation's members exhibited that behaviour. Weights of 5, 4, 3, 2, 1 were given to 'it always happens', 'it happens very frequently', 'it eventually happens', 'it rarely happens', 'it never happens'. Similar scales were produced to measure the degree of change in each behaviour and the difficulty associated with the change process.

5.6.2. Scale validity and reliability

Reliability refers both to the measurement instrument and the conditions under which it is applied. To increase reliability means to reduce the error component that is associated with any sort of measurement. The tactic used to increase reliability was the reduction of categories of behaviour such as learning into a pool of items.

The logic of using many items instead of one is explained by the fact that each answer has a part that corresponds to real measurement and one that corresponds to error. The part that represents real measurement adds up when there is more than one item while the error in each item does not. The result is that the more items we have (up to a practical limit) the smaller the total proportion of error is.

An indication that the items are measuring a single homogeneous variable is the degree to which items correlate with each other. This is a statistical test that indicates the homogeneity of the scale. Cronbach's Alpha coefficient represents an estimation of the proportion of the total variance that is not due to error and is a good estimation of the global reliability of our scale.

In the appendix 2 we show the calculations and results. The shown calculations refer to the "purified" scale, although the results differ very little from those obtained with the original pool of items (alpha = 0.8576 and standardised alpha = 0.8558). The Cronbach's
Alpha obtained is 0.8639. Oppenheim (1992) considers any result above 0.80 to be satisfactory.

It is not possible to ensure concurrent validity because an external acknowledged gold standard is not available to judge our results against. In the same way we are prevented from establishing predictive reliability because there is no similar research that we can compare our results with. The only piece of research that we can refer to is Gittel (1996). She found that Southwest had considerably more intense co-ordination behaviour than its rivals. However, her research is limited to co-ordination, whereas we investigate also learning and entrepreneurship. Thus we are restricted to base validity on construct validity.

One important step to ensure the validity of the constructs is to demonstrate that they are based on solid conceptual grounds indicating that there is a correlation between the constructs and the abstract concept that has been measured. In previous chapters, the connection between the items used in the measurement and the categories measured is well grounded in the literature.

When external references of validity are not available the researcher should concentrate more on content validity and in making the measurement reliable. In this sense validity and reliability become related to each other (Oppenheim, ibid.). To increase reliability and validity, we performed factor analysis to ensure that the items had something in common that could be called respectively, co-ordination, entrepreneurship and learning.

Initially the five items that measured co-ordination behaviour loaded on two factors. The first item loaded very strongly on factor 2 while the others loaded on factor 1. When the first item was deleted, all items loaded only on one factor, and thus we concluded that we should “weed out” this item. This item was measuring a dependency that, we concluded, was more dependent on the contingencies of the business processes than on shop floor behaviour.
The item pool measuring entrepreneurship had all its items loading on only one factor and thus there was no need to alter the original scale. The learning item pool, however, had the items loading on two factors. Most of the items loaded on factor one. We then decided to eliminate the only item that loaded more strongly on the second factor. The eliminated item (number five in the results) represented the behaviour of documenting routine solutions.

In fact, it is more appropriate to consider documenting under activities related to process control and redesign due to its close connection with ISO standards, than as an organisational behaviour category. With this item eliminated, the items measuring learning behaviour loaded on only one factor.

With our scale “purified” by the elimination of those two items we tested the three behaviours together. The results showed that the item loaded on three factors as would be expected. The consistency was reinforced by the fact that the items showed a clear pattern of loading more heavily on the same factor according to the behaviour they represented. Items representing co-ordination, entrepreneurship, and learning loaded respectively on factors three, two, and one.

We then tested our improved scale for the Cronbach alpha coefficient and the result obtained represented an improvement on that obtained before the “purification” of the scale, which was already good enough. The new results were alpha = 0.8639 and standardised item alpha = 0.8631. Normally alphas above 0.80 are considered a good indication of reliability.

5.7. Data analysis

In order to perform data analysis we had to choose a specific analytic strategy. Yin suggests four alternatives: pattern matching, explanation-building, time series analysis, and program logic models. The analytical strategy chosen in this thesis is explanation
Milles and Huberman (1984) consider that Hume's rules can be greatly extended. Features such as local emphasis, causal complexity, temporality, retrospection, variables and process should also be considered. They call attention to causal complexity. Unlike the "billiard ball" idea, causation cannot be assumed to be unilateral. They quote Weick (1979) who considers that when there are two related events it cannot be assumed that one is the cause and the other the effect, because ensuing events may modify what originally is the cause, which then becomes the effect.

Researchers usually address this problem by creating a "cause network" in which the variables are organised in terms of cause-effect loops. Doz (1996) defines the evolution of partnership alliances in terms of a loop where learning is facilitated or hampered by initial conditions and revised conditions. In turn, learning allows the re-evaluation of initial conditions, thus closing the loop.

5.7.2. Explanation as relationships, not causality

Dubin (1969) notes it is implicitly assumed that a statement of relationship may be taken as a statement of causality. When developing laws of interactions among units, scientists have to determine which units (B, C,...) can be linked to a given variance of unit A, and then have to link the variance in A to variations of the values of the other units (B, C,...). Consider the case of volume expansion of a gas. It can be said that there is an inverse relationship linking Y, the measured volume of the gas, and the measured pressure on the gas, X.

An early scientist could plot the relationship on a scatter diagram. He could then draw an average fitting line defined by: Y = a + bX. He would notice that actual values would result in considerable error. He would then probably notice that there were other variables that also affected the outcome of Y. After many experiments he could discover that other variables should be considered. By controlling pressure and the mass of gas, he could obtain more accurate results. His findings could then be enunciated as: At a constant temperature, a constant mass of gas occupies a volume that is in inverse ratio to the pressure it supports. This is, in fact, Boyle's law.
The law above gives us a precise statement of the relationship between the units’ volume, temperature, and pressure. Dubin (ibid.) calls the attention to the fact that “only the values of units are measured in a relationship, never the form of the relationship itself”. The only thing we know is the value of the variables. We know nothing about the relationship of the variables. Still we can predict the outcomes very accurately. Thus there is a statement of relationship, not causality, linking inputs to outputs.

We conclude that explanation building is not necessarily about setting observable causal links between the variables and the outcomes. This path, as already discussed, is not available to us. Instead, we set out to explain the phenomenon by determining a statement of relationship between the state of the variables and the outcomes.

5.7.3. The power and precision paradox and the goals of data analysis

Any scientific endeavour which addresses theories of social and human behaviour has two possible goals: (a) prediction and (b) understanding. Dubin (ibid.) argues that in terms of theory building in behavioural sciences, “understanding and prediction are not often achieved together”. He proposes the following classification:

<table>
<thead>
<tr>
<th>Goals</th>
<th>Understanding</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical focus</td>
<td>Interaction</td>
<td>✔</td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.1- Focus and Goals of the research.

Prediction is defined in terms of (a) the ability to foretell the value of one or more units making up a system and (b) whether the condition or state of the system as a whole can be anticipated. Both (a) and (b) focus on the outcome. On the other hand, understanding focuses on the interaction between the variables which make up the system, and concerns the way in which these interactions occur.
It would be logical to expect that it would be necessary to understand the nature of the interactions of the variables in a social system before we could predict any outcome. But in fact we can make precise predictions by treating social systems as a black box and ignoring how the outcomes have been produced. Even with incomplete knowledge of the systems functioning it is possible to draw accurate predictions about when system changes occur, which state will succeed the other, and the values of variables. This is the precision paradox.

In contrast the power paradox argues that models of social systems behaviour may be powerful in creating knowledge about a social system but they may be very poor at predictions. Dubin (ibid.) suggests that this happens because models of interaction are often compromised in three areas: (a) the analytical attention has to be focused upon a rather limited realm of phenomena, and therefore it produces meaningful understanding about the facts that happen inside that specific scope, (b) scientists may opt for controlling or holding other variables in order to clarify understanding, and the simplification may increase understanding while certainly decreasing the prediction power (c) research may also focus on broad relationships and therefore become very vague as an outcome predictor.

An example of how research geared towards explaining how the relationship between the variables has a weak prediction power is Gittel (1996). She explores and enhances understanding about the relationship between several systems' elements involved in crossfunctional co-ordination. The resulting model shows how an organisation's systems and managerial practices contribute to altering the way people think about their jobs. The alterations of the cognitive framework of employees impact on operational performance.

However it is very unlikely that this can predict that all companies which have similar systems and practices will achieve superior operational performance. Assuming operational performance as dependent only on the co-ordination behaviour of employees is to limit the realm of the phenomena, and to hold other variables constant, such as the behaviour of top management or the control and redesign of business processes. Gittel
(ibid.) created an option for understanding the relationship between the variables, rather than predicting outcomes.

In this sense, the above paradox has profound consequences on the structure of the case-studies write-ups and the data analysis. A study should have a clearly defined goal. It should either focus on understanding the relationships among variables or on making predictions of outcomes from the value of the variables.

This study's objective is to predict outcomes and consequently data analysis is concentrated on measuring the variables. This is consistent with the meaning of process adopted. Conclusions should be drawn in terms of a notion of relationships rather than a notion of causality although eventual relationships among the variables can be used only as a substitute for conclusions.

The quantitative data in this research feed into the qualitative research. The survey was designed to measure the intensity of organisational behaviour in the organisation and the degree to which it had evolved. By using a Likert style scale we treated our results as if they were integers. We calculated descriptive statistics, such as the distributions mean and histograms, and measures of spread, standard deviation. The range was defined as between 1 and 5.

The next phase consists of carrying out tests to observe differences between the different companies and their various behaviours. Therefore we had a matrix of test cases of 4 by 3, where 4 was the number of companies involved in the study and three, the number of behaviours considered. For instance we wanted to know if a certain behaviour, say learning, differed among the companies, or alternatively we tested for differences between behaviours in one specific company, say Toshiba.

As our distributions were approximately normal, we used ANOVA (analysis of variance) to compare the means. The analysis of variance told us whether we could reject the null
hypothesis (H0) or not, the null hypothesis meaning a significant difference between the means.

We then used a graphical analysis to evaluate the significance of the differences because although differences can be considered statistically significant they may have no practical relevance (Fink, 1995). If the means and confidence intervals do not overlap in the chart a difference can be assumed to exist. When the intervals overlap but not the means, then nothing can be asserted, and a new test, this time comparing the two means in question, has to be performed (Fink, 1995). We used two tailed t-tests (alpha = 0.05) where the distributions could be assumed to be normal, or otherwise chi-square tests.

5.8. Data treatment

Case study analysis is the most difficult part of doing case studies (Yin, ibid.). Although there are no pre-set recipes to treat the data, the adoption of general strategies to organise and analyse the data is a necessary step for quality case studies. Data were organised in case write-ups which were written according to theoretical propositions and arranged according to constructs set earlier in the research. The case study write-ups reflect initial data and insights, the literature, and the research issues. This strategy is classified by Yin as the most desirable.

The explanation-building strategy adopted here, is based on establishing a relationship instead of demonstrating cause and effect links. Although different sites represent different situations, the objective in explanation-building in multiple case studies is to build a general explanation that fits each of them.

Eisenhardt highlights a number of elements that are particular to building theory from case study research. Beyond the implications for sampling and methods of data collection which were already discussed, theory building demands other specific adaptation to case study design.
If relationships are uncovered, the research should be able to explain through the literature why that relationship exists. The comparison of the findings with the literature is the key to the internal validity of the findings. Eisenhardt argues that it is crucial to consider a broad range of literature that increases the possibility of conflict between the literature and the findings. Where the relevant literature is contradictory, then the chances of deeper insights are increased.

She concludes that by anchoring findings in the existing literature the researcher increases internal validity, generalisability, and the theoretical level of theory building. Our findings are discussed in terms of manufacturing strategy and lean production literature, which should contrast with the resource-based literature.

Cross case analysis was also performed. The goal of this kind of analysis is to search for patterns among the sites. It lessens the inherent danger of the researcher reaching premature conclusions which are not scientifically sound. The four cases are analysed for possible similarities and differences, and the results assessed against the hypotheses.

In this chapter we have:

- Explained the sample of companies chosen in this research
- Defined qualitative and quantitative data collection methods
- Defined a scale of performance for the qualitative data collection and tested it for reliability and validity
- Defined a strategy of data analysis
- Defined the method used to treat the data

In the next chapter we begin the analysis to date. The within case analysis of the four cases is described.
Chapter 6 – Within Case Analysis

In this chapter we perform the within case analysis. The analysis presented here resulted from a compilation of the case studies that we have produced on each company. It is organised according to the evolutionary drivers that we have proposed in item 3.2. We describe the state of each of the variables in the strategic process. Qualitative data was gathered to understand the state of the managerial processes and process control and redesign. Quantitative data is used to measure the intensity of the organisational processes and the intensity of change they have suffered during the strategic processes. The final state of the variables together with the account of their variation, produce a picture of the strategic process.
6.1. Case 1 - SERASA's background

SERASA is an independent company created by Brazil's principal banks in response for their demand for an organisation responsible for gathering and processing all necessary information on credit risk management. Since then, it has grown to become the biggest financial database of South America, holding information on 4.2 million companies of all sizes.

6.1.1. Case 1 – A brief overview of the evolution of operational performance

When the marketing division was added to SERASA's organisational chart in 1989, Elcio de Lucca was appointed as its first director. The shareholder banks pressed for a complete restructuring of this organisation which they regarded as having obsolete processes. The process of change gathered pace in 1991 when the old management team left the company and Mr. Di Lucca was appointed as the new CEO. The challenge was to transform an inward looking company that had little concern for operational performance, into a company that could tap into the opportunities and knowledge from outside as well as develop outstanding performance.

The process of change that followed was based on a tripod: Organisational redesign, a new strategic planning system, and the development of quality principles and practices.

6.1.2. Managerial processes

6.1.2.a. Gap closing

The gap closing took place at two different levels. At the macro level the new CEO, with the collaboration of a couple of new senior managers, envisioned the main features of the new organisations and took the necessary steps to ensure that it happened. At micro level the new planning system allowed the organisation to identify clear operational goals each year and allocate the necessary resources through careful planning. Unlike the macro
planning, micro planning directly targeted operational issues such as the transformation and improvement of the production processes.

The CEO is a great believer in planning. He said that the organisation had had a master plan from the beginning which had not changed substantially. The master plan was devised around three broad goals: (a) to reinforce ethics in business, a particularly sensitive issue for firms in the information business and a heritage of the previous 28 years of history, (b) to develop entrepreneurial behaviour which should function as the engine for continuous change and (c) to achieve dramatic evolution of the business processes.

These three goals were to be pursued through the implementation of three concrete key plans: (a) the redesign of the organisational structure, (b) the implementation of a quality programme, and (c) the development of a strategic planning system.

The new organisational design eliminated 3 to 4 hierarchical levels, depending on their function. Now there are five hierarchical levels: CEO, function’s director, manager, team leader and member.

The new organisational design introduced a parallel area for each of the four main areas. Operations, IT, administration (which includes HR and finance departments), and marketing and sales have a smaller parallel area and were headed by a different director responsible for anticipating changes to the main function.

For instance, while the managers in operations concentrate on running the current operations efficiently, managers in the parallel area were incorporating new technologies of credit analysis, and performing tests before the implementation of new ideas in the main area. Thus the parallel area performed the role of R&D, absorbing new trends in the market and avoiding obsolete operational production processes.
An external consultant was hired to set up an internal quality department and initiated the implementation of a quality programme. The gradual development of openness for change at the bottom of the organisation was the foundation for the successful implementation of the quality programme.

Among the most significant changes achieved through the programme were: (a) change of the prevailing Tayloristic mind set. Middle managers changed their management style, to encourage the development of an empowered and participative work force. They also changed by giving priority to the quality of the outcome instead of demanding volume of production. (b) Metrics were developed and became very sophisticated. Presently, all important organisational processes are measured and their performance is tracked. (c) QCC groups were set up and gradually evolved into an informal avenue for suggestions.

The third of the key macro actions planned by management was directly related to micro gap closing processes. The idea behind the strategic planning system was to ensure that ideas would flow from the bottom to the top and back again, allowing a great deal of ownership and input from those actually responsible for implementation. The strategic and action plans of the organisation are currently decided in three forums.

In the first one, called RENASCER, all members spend one day in order participating in group dynamics where problems and possible solutions are discussed. The resulting propositions are screened by middle management who also contribute their own suggestions. In the next stage the management team gets together and discusses the strategic orientation of the business. In the third and last meeting, top and middle managers assess the results of the previous exercises and devise concrete action plans. Problems are examined at a detailed process level. The material collected is transferred to flip charts and hung on the walls to facilitate discussion. Targets are defined with the agreement of everyone involved in the project. Managers distribute their available resources to cover the various projects. Senior management ensures that the projects conform with the strategic line they have devised. Although senior management can
discuss the projects in detail they will allow other managers to exert discretion over targets and project details.

Managers report that they feel ownership over the projects and that the resources committed are firmly grounded on reality because they are determined after extensive lateral interaction. The result has been a high level of successful project implementation.

6.1.2.b. Management style

The quality programme was successful in changing the behaviour of middle managers. As a first step, they assessed their department's processes. This exposed poor performance. Senior managers and the quality department then told them that continuous improvement would only succeed if they listened to and empowered employees. Middle managers who had long been in the job for many years were set in their ways. Initially there was resistance to change.

A number of factors contributed to create a widespread conviction that the process of change was irreversible and an environment more receptive to change: (a) talks and training courses that introduced the concept of quality to the whole organisation, (b) the use of facilitation techniques, such as neuro-linguistic training, employed by the quality department to help managers confront their fears of change, and (c) the effect of the dramatic increase in performance in the first areas to embrace change. As a middle manager commented:

It was more traumatic for us than for the employees. We had to prepare ourselves because we were going to be the administrator of quality in our area and that demanded a great deal of involvement... The idea was that we were sleeping and if we wanted to survive we would have to change things.

Senior management embraced unconditionally the participative style. As explained previously, the action plans received inputs from all members and were reviewed jointly with middle management. An example is the experience of a group of middle managers
from the marketing function who proposed a turnover target and a marketing strategy. The plan was approved during the strategic planning phase and fully accepted by senior management. The actual turnover achieved was very close to the one proposed.

6.1.2.c. Senior management team work

The old management team left the company when the new CEO was appointed. The shareholders perceived that radical change in the organisation would require the new CEO to have the freedom to appoint new directors. These directors came into a new structural design where functions were to be secondary to business processes and overall results of the organisation.

This created a strong sense of collective responsibility for the overall results of the organisation, avoiding senior managers becoming inward looking in their functions. The senior managers were reported to have a strong sense of collective responsibility and collaboration towards the strategic goals of the organisation.

The secondary importance given to the functions’ boundaries was reflected in the high degree of networking at the lower levels of the organisation. When managers needed the collaboration of people in other functions they tended not to be limited by the functions’ boundaries or the need to respect hierarchy. The planning system worked as a strong incentive to lateral initiatives. Senior managers did not directly participate in the formulation of action plans. These were defined cross-functionally by those who implemented the project. The CEO commented that planning only succeeds if the concept of area and functions is not considered important, he said:

> How you plan is key... companies usually make plans in function of areas interests, it is a power struggle... who is more powerful gets more. That doesn’t happen here. We plan function of where we want to go... I’ve never allowed people to talk terms of areas.

6.1.2.d. Performance control
SERASA has developed an extensive range of metrics that measure the performance of practically all relevant processes and results. It is commonly said in the company that: “What is not worth measuring is not worth doing”. Initially implemented as part of an effort to establish TQM principles of measurement and control, 1500 different metrics are currently in use, keeping track of the performance of elementary production processes in relation to client satisfaction. The great number of metrics is explained by the fact that managers were given the freedom to implement whatever measurement they thought to be relevant. In each area a management information system (MIS) controls the performance of each indicator and the progress of ongoing projects.

Indicators are used to track and rank individual and team performance. Managers can identify people whose performance is below average and who need help to improve performance. Teams’ performance is assessed against each other and also in terms of how they are rated by internal customers. At senior management level each director has 15 indicators that are checked daily. From all the indicators chosen by the directors, the CEO selects 15 to follow periodically.

The geographically dispersed branches have their performance controlled as if they were independent companies and are assessed in terms of profit and loss. Production and sales are given points and measured against costs of administration. A performance considered normal receives no points, which implies no extra reward to the manager in charge.

6.1.2.e. Behaviour alignment

Like any Tayloristic organisation, SERASA suffered from the fact that the goals of its organisational members were local and detached from the strategic goals of the organisation. Leadership was key to breaking old behaviours and promoting a realignment of behaviour throughout the organisation.

The CEO and a few other senior managers exercised leadership by carefully observing the managerial style of middle managers and acting to eliminate managerial processes that did not conform with the new environment defined by TQM principles. If they
identified managers who were concentrating responsibilities and thus failing to use a participative style, senior managers intervened.

The CEO was the champion of the new paradigm of behaviour and all the interviewees associated his leadership with the change process. His communication abilities were fully utilised. He said that insistence on the message, which was grounded on solid argument and coherent behaviour, was the necessary factor in promoting change. The CEO considered that the current task of leadership was to create an organisation open to knowledge from outside. The organisation should be able to identify best practices in global and local terms and integrate them with its own processes and practices.

The change process targeted the individual. The mission statement of the HR function reflects actions taken by management in order to involve individuals in the evolution of the organisation: “To ensure the involvement and commitment of all members to both overall and individual results by creating the environment, tools and mechanisms, that facilitate involvement as well as personal development and satisfaction.”

A particular example of the management vision of individual development was the use of neuro-linguistic training to address psychological aspects of group behaviour and interpersonal communications. A series of courses and talks introduced techniques of effective communication and discussed the difficulties of adopting new modes of behaviour. Middle managers reported that these techniques helped them to overcome fears provoked by the new responsibilities.

The introduction of the quality concepts was regarded as a key step in aligning behaviour because it clearly showed the link between the internal process carried out by the organisational members and the performance of the organisation. Also it defined a new “modus operandi” for managers, especially line managers. The quality programme was given absolute priority and the necessary time was allowed for people to voluntarily engage in it.
The approaches to individual development and practices subsequently adopted were later synthesised around the concept of SerSERASA (which can be literally translated as SERASA been). This represented the basic principles that should underpin a culture shared by all members: customer focus, concern for constantly improving processes, respect for ideas independent of ranking, and continuous personal development.

The support and openness to change found at the bottom of the organisation were certainly helped by the fact that members perceived that they also benefited from the changes. In spite of the immense growth in productivity, nobody was made redundant. Instead, there was a very significant increase in the average earnings. This was made possible by the strong market expansion and consequent revenue increase. Members and middle managers said they had nothing to fear from the changes that the organisation might experience in the future.

The development of entrepreneurial behaviour at all hierarchical levels was a strategic goal from the beginning of the change process. The planning system and the QCC programme allowed managers and members to identify improvement projects and implement them. The alignment of the reward system with individual performance was regarded as a way to direct entrepreneurship towards the strategic goals of the organisation.

One important example of this use of the reward system was the manager-entrepreneur programme applied in the branches. The managers responsible for these branches had part of their income dependent on the performance of their branch. Later, the programme was further developed by giving different weights to particular actions that were perceived as benefiting strategic objectives of the organisation, such as attracting specific customers, or even temporary tactics.

In spite of the strong intentional element involved in the process of change senior managers recognise that managerial rationality and action are limited. This reflects the
importance of dealing with the soft aspects of the organisation in order to achieve successful transformation. A senior manager said:

The CEO doesn’t run the company. Culture, systems, and history do. We have to understand history because the company is a reflex of it in some sense.

6.1.3. Process control and redesign

Before the change process started, SERASA had no control over the performance of its business processes. With introduction of quality principles processes were mapped and they began to be measured. This was followed by the reengineering of the processes involved in the production of the main product (FICA). All the line managers were involved in the examination of the processes and helped design changes that could be readily implemented, such as the elimination of unnecessary checks and more efficient routing of the workload. These initial changes cut the process time by half, from 24 days to approximately 12 days.

Automation of the collection and storage of documents achieved extra gains. Although the organisation was achieving improvements, production was organised in large departments, whose sequential tasks were buffered by WIP. Thus the next major step was the introduction of cell production. Pilot cells were introduced and these helped create acceptance of the new organisation of production among workers. A few months after the introduction of initial pilot teams, production was completely organised in cells. There were two sequential departments in which the cells performed different tasks.

Cell production dramatically improved efficiency. Members reported that, prior to ownership and because they were physically separated, there was no feedback. As a consequence, there was no change to learn from mistakes. Now, when there is a mistake, it is automatically corrected inside the cell, avoiding the formation of WIP for rework jobs and highlighting recurrent mistakes.
The gains in terms of individual improvement have been dramatic because members who are more experienced respond to individuals' queries on the spot. The creation of team leaders has greatly improved the flow of information and the identification of training needs of the members in the cell.

The performance indicators and the feedback from the quality assurance department are used to identify the root cause of production mistakes associated with technical deficiencies of members. When mistakes are recurrent suggesting that training is needed, a panel with more experienced analysts is quickly set up.

### 6.1.4. Organisational processes

<table>
<thead>
<tr>
<th>Co-ordination</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Flow of information</td>
<td>3.38</td>
<td>0.76</td>
</tr>
<tr>
<td>b. Frequency of communication</td>
<td>3.68</td>
<td>0.79</td>
</tr>
<tr>
<td>c. Openness</td>
<td>3.68</td>
<td>0.75</td>
</tr>
<tr>
<td>d. Helpfulness</td>
<td>3.74</td>
<td>0.83</td>
</tr>
<tr>
<td>Co-ordination general</td>
<td>3.62</td>
<td>0.79</td>
</tr>
<tr>
<td>Degree of change</td>
<td>3.35</td>
<td>0.93</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entrepreneurship</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Breaking from past behaviour</td>
<td>3.65</td>
<td>0.78</td>
</tr>
<tr>
<td>b. Striving for continuous improvement</td>
<td>4.23</td>
<td>0.79</td>
</tr>
<tr>
<td>c. Developing personal links</td>
<td>3.58</td>
<td>0.83</td>
</tr>
<tr>
<td>d. Tackling problems and dilemmas</td>
<td>3.60</td>
<td>0.84</td>
</tr>
<tr>
<td>Entrepreneurship general</td>
<td>3.77</td>
<td>0.81</td>
</tr>
<tr>
<td>Degree of change</td>
<td>3.27</td>
<td>1.04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning:</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Individual influence</td>
<td>2.91</td>
<td>0.79</td>
</tr>
<tr>
<td>b. Eliminating ambiguity</td>
<td>3.29</td>
<td>0.76</td>
</tr>
</tbody>
</table>
SERASA scores high in terms of its organisational processes. Members were asked about the frequency of organisational behaviours. The resulting overall score of 3.4 (SD = 0.95) indicates that these behaviours tend to occur on a very frequent basis. The score of 3.2 (SD = 0.98) indicates a strong evolution of these processes since the beginning of the change process. Personal open-ended interviews with staff and line managers corroborate this significant degree of change.

A number of factors have clearly influenced and fostered the development of high performance organisational processes. The creation of teams, for instance, brought people physically close and helped develop strong personal links. The flow of information was also greatly improved by the creation of teams. As a result, both co-ordination and knowledge behaviours benefited.

Entrepreneurial behaviour was also very salient, highlighting the push of all members towards continuous improvements and their commitment to the evolution of the organisations' performance. Learning scored high on most items. Knowledge flow was highlighted. This was supported by an organisational concern for personal development.
and training. This organisational design favours learning because the development function fully tests suggestions and new concepts before they are ready to be implemented.

The ability of individuals to influence their own and their colleagues’ work practices scored a relatively weak average. This was a concern expressed by some members who perceived management as giving relatively low importance to their opinions. The fact that the computer systems were not very flexible, because alterations needed to be done to the mainframe systems, also contributed to making individual influence more difficult.

6.2. Case 2 - CIGNA's background

CIGNA Health Care UK is part of CIGNA Corporation, a multi-billion pound company employing 50 thousand people and generating a turnover of approximately 15 billion pounds. CIGNA UK has around 250 employees and a turnover of 80 million pounds, and operates in the segment of private health insurance.

6.2.1. A brief overview of the evolution of operational performance

CIGNA UK embarked on the process of change as a reaction to a deep crisis. A few years after being acquired by the CIGNA corporation, when was trading still under the name of crusader insurance, it suffered severe losses, a declining reputation among customers and a high turnover of employees. Management considered its survival chances to be very slim. Dramatic action was taken. The English facilities, where most of the back office operations were located, were shut down and reopened in Greenock, Scotland.

Few of the old employees accompanied the move. The events that followed resulted in a completely different company from the one that had started the change process. Location, people, structure, management team, management style are all different from those of the initial operation. The company is back into profitability and boasts huge operational improvements such as: claims turnaround down from 15 to 4 days, quotation time for new businesses down from 17 to 2 days, quality up by 55 percent, and service levels up
by 52 percent (the explanation of these categories is given on the section on performance control).

6.2.2. Managerial processes

6.2.2.a. Gap closing

The gap closing process had two distinct moments. Initially management could see no objectives or end state. The sole objective was to ensure the survival of a business that had no competitive edge over its rivals and was suffering heavy losses. CIGNA UK dropped the pension life business and moved to Scotland in an attempt to lower operational costs. The former operations director stated:

> By the end we had re-engineered the whole company, but people did not necessarily set out on a march like that. If we are completely honest, we decided to survive, which meant moving to a low cost area, sorting out our business priorities, dropping certain line of the business and picking up new ones, and changed the way we worked so that we reduced the overhead. As it happened, we changed the culture of the company and now we have a very gung-ho empowered work force throughout the organisation.

A second phase started a few months after the company began operating in Scotland. The management team was slowly beginning to engage in the search for goals that should be pursued by the organisation. At the same time, the US headquarters, which had been through an extensive reengineering process, wanted its British subsidiary to follow suit. A change team was assembled. This shared no members with the management team. It was led by a person sent from the parent company who had participated in other reengineering projects within CIGNA.

Management engaged in formal assessment of the environment to establish what was important to its potential customers and how the company was performing on those
dimensions. Questionnaires were sent out to customers and personal interviews were held with current and former customers.

The result was a compelling and detailed picture of the relative competitive position of the organisation and its desirable future state. It provided objective gap-closing objectives and guided plans for reengineering. It became clear to management that there was a deep incompatibility between the organisation's systems and processes and the desirable end state. Managers realised that gradual change would not be enough.

After the gap-closing objectives had been clearly identified, the change team started interviewing the management team in order to evaluate their openness to change. A series of talks and training were promoted in order to prepare for a climate of change at the bottom of the organisation. When the time was ripe, pilot teams were launched and the organisational structure changed from a hierarchical structure to one with only three hierarchical levels organised in a matrix form.

The parent company appointed a new MD in place of the authoritarian style MD who initiated the change process. Having been the HR manager, the new MD had a profile more suitable for handling the soft elements of change. The change team coached the pilot teams and helped them set the initial performance goals. Increasingly the teams began to set these goals by themselves.

6.2.2.b. Management style

The strong transformation of the internal context, which was considered necessary for the success of the reengineering project, meant loss of power and change of behaviour for both senior and middle managers.

The change team knew from previous experiences that a lot of ground work would have to be laid before the actual change process could start. An intensive strong job of consensus building lasting four months preceded the first concrete actions. This
communicated the need for change and made the project, the goals, and how progress should be tracked, very clear.

The success of the teams depended on the transformation of the middle managers’ style. The old supervisors were trained for the new role of team leaders. Many could not adapt. To absorb them a function responsible for auditing output quality and managing control and redesign of processes was created. By not making redundant the line managers who could not become team leaders, the organisation avoided losing technical expertise. A team leader commented:

> The old type of supervisor is that kind that would say do this, do that. The facilitators’ role is fairly different. Some people couldn’t adjust. They are still in Cigna as technical department.

As the flat structure based on team production was being consolidated, a widespread conviction that there was no turning back from the change process grew stronger. However, the new philosophical framework that had been firmly implanted at team level still faced resistance at senior management level. Most of the senior managers insisted on retaining all powers of decision for themselves. After attempts to integrate them into the new culture failed, they had to leave.

> It is one of those things. You rebuild the company and the culture underlying it, but if you don’t fit that it eventually washes you away... If you are not up to the fight of doing it and if you can’t live with the new environment, it reaches you very quickly and you get washed away.

Today teams are empowered to take almost every decision that refers to paying a claim. Teams also define their own targets with input from team members.

> To get a decision [in other insurance companies] was virtually impossible. Now we’ve got two layers. If the teams cannot handle it themselves they come to me, and that is it.
6.2.2.c. Senior management teamwork

The change team sent by the parent company expected to find the main obstacle to change in the ability of senior managers to work together, especially during the process of implementing change.

The big thing in that particular [initial] six months was the question of whether [senior] management would support change or not, because that is the hard part.

Senior managers were carefully interviewed prior to the implementation of changes so that the change team and the MD could gauge of their ability to jointly support the changes. A powerful message was delivered that nobody was above the change process. The MD attempted to engage resistant senior managers in a joint effort:

The easiest thing to do with senior managers that don’t like reengineering is to go around them... But we have actively sought to put people most resistant to change in some of the projects first positions.

Gradually other managers who were better suited to the new environment were substituted for the original management team. Today, senior managers report that the members of the management team are considered to be mutually very supportive. Middle managers and members also acknowledged a great deal of teamwork from senior managers.

The transformation of the hierarchical structure into a matrix based one, contributed to the collaboration of managers who shared responsibility for overall results. The political importance of big functions (which were disbanded) was eliminated. Big functions had fostered the development of local goals and power struggles.

6.2.2.d. Performance control
A number of metrics were developed during the reengineering project in order to track its progress. The same metrics are still applied to control current operational performance. These metrics are used to track and benchmark the performance of the various teams. The metrics are:

- **Quality**: Measured in terms of team audit results, or the proportion of the sample of audits that are correct. It evolved into considering different weights according to the potential damage provoked by a mistake. The number of claims paid and the ratio of complaint per unit received are also considered.

- **Productivity**: Average number of claims processed per person per week, and the average number of units in WIP per week. Targets of productivity acknowledge the difference in the amount of work performed by teams which cater for only a couple of corporate clients compared with those which deal with individual policies, because the teams dealing with individual policies have far more paper work to do.

- **Level of service**: A mix of the proportion of renewals per new business policies processed, and administration post processed.

- **Premium in arrears**: The cumulative reduction in volume and value of arrears.

Customer satisfaction is also scanned on a regular basis through individual interviews, focus groups, and customer satisfaction surveys. Performance of the above items is monitored closely and weekly results are discussed at a Friday meeting between team leaders and the operations manager, where team leaders set the targets for their team.

The strategic objectives set during the planning phase - responsiveness (turnaround time), quality (consistency or conformance to standards) and productivity - determined the definition of the control metrics and focused efforts to improve performance.
We were measured against them [the metrics] and set targets that although were not easy could be achieved... we set our own goals and objectives with the help of a facilitator... For instance, we wanted to have a claim paid within 5 working days. At that time we felt that it was unattainable. At the moment our team is achieving two or three days turn around time. I have dealt with today’s mail already.

6.2.2.e. Behaviour alignment

In previous reengineering experiences, CIGNA Corporation had not worked on the soft side of the organisation but had concentrated on redesigning the business processes. Having learned from a number of flawed experiences, CIGNA recognised the importance of using a reward system and target setting by the teams to generate commitment and ownership by them, Kozik says:

In Cigna’s first reengineering project in the US we did not discuss reward systems early enough. We had introduced teams but not team goals. Whether teams will go the extra mile for the customers depend on monetary and non-monetary rewards.

The change in behaviour in the organisation as a whole was very much dependent on the leadership of Roger Dockett. The new MD represented a change in the style of leadership from the previous MD’s authoritarian style. He was a key figure in changing the culture of the bottom of the organisation by championing the change process and dealing with internal resistance. A senior manager observed:

There are needs for different skills and leadership styles at the beginning and at the end of the change process.

The new MD assigned top organisational priority to coaching and supporting the pilot teams. Senior managerial involvement helped to create openness for change at the bottom of the organisation. After the success of the first two teams, staff members demonstrated interest in becoming part of a team. Those who were not a part of the initial teams, felt as if they had been forgotten by management.
Management initially set team performance targets and part of the individual income was dependent on the achievement of those targets. The scheme went until it members no longer perceived it as an incentive. Nevertheless, at the beginning it was very useful in creating team spirit and aligning behaviour with operational objectives.

The teams were measured and rewarded individually. That provoked a healthy competition between the teams to see who was the best team. That also helped to form the group. That ran for one and a half year and was substituted three years ago... The new system focuses on developing the individual but not on performance.

The new schemes differentiated payments based on the development of new skills through an individual’s voluntary engagement in a training programme inside and outside the company. Non financial rewards were also used as “successful people campaign” that acknowledge those who made fewer mistakes in paying the claims, and those voted the most helpful were given a special internal reward. Letters of praise from satisfied customers were also published.

6.2.3. Process control and redesign

The redesign of processes in CIGNA UK experienced two significant stages. The first and by far the most important was the move to team production. The second was when the new processes were already stable and an effort was made to increase the efficiency of the processes by eliminating unnecessary operations and replacing them with more efficient ones.

The move to team production meant that processes which had previously been performed by six different areas (credit control, new businesses, renewal, post, claim payment and files) had to be performed by only one team. Instead of adopting a programmatic approach and attempting to design the new business processes, which had been unsuccessfully attempted in previous experiences, management left members of the pilot...
teams to develop the processes on their own, following a “do it, test it, fix it” philosophy. A team member described this phase:

Most of the procedures existed before in the two different departments other procedures have been added as a necessity, as a check to see if a claim has been paid in ten days, how do you check that. These are situations that were brought up through time. Most of the procedures have came about as departments expanded, as the drive for quality and quantity increased and became more focused, then more checks and balances are necessary to make sure that you are hitting your targets.

Management carefully coached the initial teams, sorting out personality, technical, or other problems that could arise. Teams were expected to evolve through a process in which they start off as new teams and ended up as mature teams. At this point, the process was successfully completed. The difference between the two was that new teams were concentrated only on meeting the workload, improving quality, and team development, while a mature team was focused continuous improvement and problem solving, and did not depend on management to control and set targets. The transition between the two stages was estimated to take more than eight months.

We help they train, then we let them practice working as a team solving problems. We watched what was happening so that we can help build up teamwork. Then we let them watch over some businesses. It was chaos at the beginning. People did not know what to do, they got fed up because management had to come and tell them what to do every day. You have to let people have ownership of their work, to be empowered, but is chaos because they don’t know what to do they never worked together before. You have to coach them through all of these problems until it starts picking up, slowly.

After all the teams had reached maturity the business processes were standardised through the adoption of the ISO 9000 standard. Then a second reengineering phase followed. Cross-functional teams were created to identify inefficiencies and propose improvements along two core business processes.
The first project was aimed at the business processes which dealt with billings and commissions payment. Similar processes from companies such as BT and Barclays were benchmarked and the cross-functional team interviewed team members involved in the process, to gauge their opinions.

The processes were mapped to understand the complexities involved and the hands-off incurred. Implementation of changes which involved not only the processes but also the computer system was approved. The implementation took two years to be completed. The second project, aimed at the claim payment processes was initiated in August 1995 and was completed in the second half of 1996. It followed a similar path.

### 6.2.4. Organisational processes

<table>
<thead>
<tr>
<th>Co-ordination</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Flow of information</td>
<td>3.00</td>
<td>0.71</td>
</tr>
<tr>
<td>b. Frequency of communication</td>
<td>3.82</td>
<td>0.95</td>
</tr>
<tr>
<td>c. Openness</td>
<td>3.94</td>
<td>0.90</td>
</tr>
<tr>
<td>d. Helpfulness</td>
<td>3.94</td>
<td>0.90</td>
</tr>
<tr>
<td>Co-ordination general</td>
<td>3.68</td>
<td>0.87</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.65</td>
<td>1.18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entrepreneurship</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Breaking from past behaviour</td>
<td>4.24</td>
<td>0.56</td>
</tr>
<tr>
<td>b. Striving for continuous improve</td>
<td>4.35</td>
<td>0.61</td>
</tr>
<tr>
<td>c. Developing personal links</td>
<td>4.24</td>
<td>0.75</td>
</tr>
<tr>
<td>d. Tackling problems and dilemmas</td>
<td>4.35</td>
<td>0.49</td>
</tr>
<tr>
<td>Entrepreneurship general</td>
<td>4.29</td>
<td>0.60</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.64</td>
<td>0.78</td>
</tr>
<tr>
<td>Learning</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>a. Individual influence</td>
<td>4.12</td>
<td>0.70</td>
</tr>
<tr>
<td>b. Eliminating ambiguity</td>
<td>3.76</td>
<td>0.75</td>
</tr>
<tr>
<td>c. Testing</td>
<td>4.12</td>
<td>0.99</td>
</tr>
<tr>
<td>d. Articulation of knowledge</td>
<td>3.71</td>
<td>0.99</td>
</tr>
<tr>
<td>e. Knowledge flow</td>
<td>4.24</td>
<td>0.44</td>
</tr>
<tr>
<td>f. Knowledge concentration</td>
<td>3.19</td>
<td>0.98</td>
</tr>
<tr>
<td>g. Challenging assumptions</td>
<td>3.71</td>
<td>0.99</td>
</tr>
<tr>
<td>Learning general</td>
<td>3.84</td>
<td>0.90</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.50</td>
<td>1.11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall result</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>3.92</td>
<td>0.87</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.58</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Number of respondents = 16

Cigna scored extraordinarily high indicating that the behaviour items listed above occurred “very frequently”. A significant number of behaviour categories stayed between “very frequently” and “always” (respectively 4 and 5 in our scale). It should be noted that all categories of behaviour associated with entrepreneurship scored above four. All members and team leaders personally interviewed reported outstanding entrepreneurial behaviour.

One manager said that if there was one thing that would set the company apart from the competition, it was the entrepreneurial spirit of its members. As an example, a manager reported that when an important new corporate client joined the company, team members came to see him volunteering to take on the new account. A team leader said that all team members pulled their weight.
The reported tight bonds which linked team members presumably contributed to co-
ordination. Individual influence - which testifies the great level of empowerment of the
team members - testing and knowledge flow, are three dimensions of learning that scored
above 4, indicating a high profile of learning activities.

6.3. Case 3 - TNT's background

TNT is a multinational transportation group that operates worldwide and has 8000
employees in the UK who operate 3000 vehicles moving 220,000 parcels for more than
26 thousand customers. Apart from the core Express division responsible for the
deliveries of parcels within the UK, other divisions specialise in the logistics of daily
press and car parts supply to manufacturers. TNT Express is made up of a network of
depots situated all over the UK connected by a distribution centre called PDC (Parcels
Distribution Centre). The basic operation consists of three different stages. First, parcels
are collected by the depots during the day. In the evening the parcels are sent to the PDC
where they are sorted overnight, and shipped back to the depots for early morning
delivery.

6.3.1. A brief overview of the evolution of operational performance

The process of evolution in TNT started in the aftermath of a UK postal strike in 1988.
During that time, the parcels division accepted all sorts of freight into its network. The
overflow and the incompatibility of much of the freight brought its operations to the
verge of collapse. This was the climax in a period of declining competitiveness. Growing
competition was hurting profits and margins and internal employee morale and
satisfaction were very low.

The turnaround process had two distinct phases. Initially, management engaged in formal
strategy formulation and adopted broad strategic lines around customer focus,
employees' satisfaction and continuous improvement, and initiated a change of market
orientation. This last action produced structural changes in operations and helped the
second phase of the process in which the emphasis changed from sales to operations. In
the second phase the EFQM\textsuperscript{17} model was formally adopted, resulting in the achievement of the 1994 UK Quality Award, the 1995/96 European Quality Award, and the 1997 Service Excellence Company of the Year award.

Some of the outcomes of TNT’s new competitive position include a revenue growth from £144 million to £230 million since 1993 and the fact that none of TNT’s 20 major clients has defected in the last three years. From those, 16 have been trading with TNT for more than five years.

6.3.2. Managerial processes

6.3.2.a. Gap closing

The postal strike of 1988 exposed the fragility of TNT’s competitive position. The operations were brought to the verge of collapse and called attention to a situation of deep crisis. Increasing competition in the industry caused profits to decline. The company’s lack of competitiveness, evidenced by alarming figures such as a retention rate of new customers of only 8 percent, called for urgent change.

The CEO engaged all divisions, but especially the core TNT Express division, in a reaction process that had to concentrate on three central points: customer focus, employee satisfaction, and continuous improvement. A wide employee survey was performed and provided managers with many clues as to what was wrong in the company. A senior manager said:

\begin{quote}
If you go back to 88, when we looked to our business, profitability in real terms was reducing. Wasn’t going forward... We actually did an employee survey called project 2000, because we received feedback from the depots that all wasn’t well within the business, and so we did this employee survey to find out what our employees felt. That brought out a lot of things. They said that we have too many right schedules in the market and it was confusing our customers, we have too many
\end{quote}

\textsuperscript{17} European Foundation of Quality Management.
consignment notes, and we weren’t particularly honest with our customers, we had surcharges, etc.

Based on general lines set by the CEO and the employees’ perceptions of the problems, the basic strategic principles of the business were organised around the following seven points:

- Service driven (Top quality service)
- Revenue Quality (Reflect the service we offer)
- Innovation (new product, new system technology based)
- Customer focus
- Cost control (not just cost cutting)
- Investment in technology (consistently looking at what is available)
- Honesty and Integrity (with both customers and workforce) - “We were not so honest before”

Action plans focused on two distinct areas. First, customer interface had to be simplified. TNT operated 52 possible schedules and sales people were entitled to apply for discounts that ranged from 1 percent to 60 percent of the published price. This resulted in more than 3000 possibilities for the customer causing confusion and a great number of enquiries. Also, the high discounts were giving an impression of expensive pricing. The sales processes were redesigned. Discounts were eliminated and one simple form replaced the previous 17 forms available to customers. A new IT system performed most of the steps automatically.

The second target of the action plans was to redefine its market niche. TNT had pioneered next day delivery in the UK, but by 1988, this represented only a fraction of its total business which still operated the three day delivery. The kind of freight that would be most suitable for TNT’s network was carefully identified and the sales contracts adapted to pursue it. However the decision to gradually move to this market niche faced great opposition from the depot managers who did not want to lose revenue by eliminating the three day traffic.
We were saying to depots that they should get rid of 3 days revenues. A depot would want to lose any revenue because he would see the knock on effect it has in the costs. It doesn't affect their costs. We were trying to convince them. We were saying we don't want this traffic. But that is not enough you have to convince them and you don't do that by bringing everyone to a big forum. You do that on a one to one basis. You convince people that will convince other people.

The move to next day delivery produced an effect that was not envisaged by management. As more and more parcels were being delivered the following day instead of remaining in the network for three days, buffers were eliminated. By 1992 when TNT was consolidating its next day delivery market, it had moved to sorting all of its freight overnight. Parcels are now moved in an almost continuous flow from the point where they enter the network to the delivery depot. This marked the end of the first phase.

The second phase began with a new strategic process based on the formal adoption of the EFQM model, focused on the excellence of operations. There was a strong push for the adoption of a management style compatible with TQM principles and operations were targeted for improvement. Extensive customer surveys identified the most important service attributes from the customer's point of view. Since then, metrics to measure operational performance have been developed and monitored to ensure the focus of attention on the performance evolution of the most important service attributes.

The headquarters set to all depots gap closing targets for cost and service attributes of performance. Depot management is left free to determine what will be done to achieve those targets. An important structural action was to upgrade the machinery and software in the PDC to support the growth in volume handled by the network.
6.3.2.b. Management style

Senior management was keen on promoting the necessary changes when the organisation was facing the crisis situation but they were less keen on changing their own management style. In fact, the CEO pointed out that the biggest challenge he faced was to convince senior managers to change their management style. He commented:

There were people running this organisation that would sack a general manager at the drop of a hat. And the general managers were treating people bellow them in the same manner. That cannot be a long-term strategy. It can be very effective sometimes, but only in a short span.

Gradually senior management changed from an autocratic style - defined by a manager as "just get on with it and don’t ask questions" - to a new approach in which they would seek to explain the rationale for their actions and allowed people to question it. The CEO’s direct line is now open to members of any rank so that they can deal with him directly if they feel they need to do so. The posts of regional director were created to facilitate communication with the managers of the depots.

From 1992 change of managerial attitude began to filter down through the ranks. The CEO, to senior managers, and then to the depot managers. Depot managers developed more ownership of their work and changed their attitude towards their subordinates. But in the PDC, things were moving in the wrong direction. The change from day shift sorting of three days traffic, to overnight sorting of the next day traffic, accelerated operations and imposed shorter time limits, contributing to increase tension between management and workers.

An authoritarian manager opposed strong union activity in the PDC. By the beginning of 1995, senior managers in the Express division became increasingly concerned about promoting a culture of continuous improvement in a climate where there were adversarial relationships between management and workers. To overcome this problem, a manager
who supported participative behaviour replaced the authoritarian manager in the PDC. He said:

Initially they were saying why does he ask so many questions, this is the only way we know about how to do it. Soon they started to think and realise better ways of doing things. The management bellows me started to make changes themselves. Why have you changed that? Because you are going to bloody start to ask me to change, would be the answer. LOBs were suggesting better ways of doing things and when asked why they hadn't suggested before they would say that nobody was prepared to listen to them.

Senior managers wanted middle managers to develop a different attitude and embrace continuous change. Specific courses were designed for these managers as a way of developing new skills and encouraging their support of continuous improvement. The next step was to develop a course for foremen. Although they had their job description changed to section leader, they were still performing the same tasks of supervision. A training program, called Top Gun, was implemented which aimed at developing skills such as briefing and team working, which were necessary for a team leader.

Shop floor members had observed a significant change in management attitudes but are still resentful about years of bad relationships with management and line supervision. A section leader who was an LBO not long ago commented:

When management started implementing a more participative culture you get the resentments of the years before when you were told what to do. The resentments are still there... At the moment we are starting to change people's attitude. LBOs are starting to have an interest about things. Before they would say I wouldn't give you anything, you are management.

6.3.2.c. Senior management team work
The success of the change process was dependent on the teamwork of senior managers. The particular strategy of eliminating unsuitable traffic in order to develop a premium market faced fierce opposition from depot managers. When profits temporarily declined, depot managers openly criticised the strategy. Nevertheless the champion of the initiative, the sales director, received full backing from the CEO and the MD. He said:

I personally would have a one off chance. If you do a U-turn in your strategy you will lose the credibility of the staff, you would show your strategy wrong, and you would have to leave the company. You’ve to make sure that it is right. The CEO in this period is key because if he weakens and doesn’t give you the support you are doomed to failure.

The increasing drive for improvement of operational performance highlighted the importance of closer co-operation between sales and operations. Previously, sales and operations directors had never co-ordinated their actions. Now they have a fine tuned relationship because, although TNT is still a sales driven company, there is an understanding that market actions have a direct effect on operations’ ability to deliver price efficiency and quality levels. The offices of the MD, sales director, operations director, and the manager responsible for the PDC are located side-by-side. Their offices are very close to one another and they communicate frequently and informally.

The senior operations manager controls a number of variables such as tonnage and number of parcels moved. When an alteration of any variable causes costs to increase, the operations manager, with the sales manager, takes the necessary action to correct the cause of the problem. For instance, in a particular week an increase in the tonnage of the traffic of 10 percent was registered, which caused unit costs to rise in a higher proportion. The operations manager immediately asked the sales manager to kill the undesirable traffic, which was causing the tonnage to go up. By quickly instructing the sales people to refuse particular kinds of parcels, the sales manager helped the unit costs to return to normal levels.
6.3.2.d. Performance control

After the company had formally adopted the EFQM model, there was an effort to develop metrics of the performance of the service attributes that were identified as the key to customer satisfaction and operational costs. Today these measurements represent the main lever of control over the network of depots which management uses to evaluate the performance of individual depots and of the network as a whole.

Service quality is measured in terms of percentage of delivery on time, the number of failures to deliver, misroute, number of missorts, and the number of late line hauls. The importance of directing organisational attention to specific service attributes cannot be understated. Delivery on time, which was identified by numerous customer surveys as the single most important buying criterion, has improved dramatically since measurement started. "It is a matter of driving people's attention to it", said one manager. Today about 99 percent of the customers receive their consignments on time. This number accounts also for situations beyond TNT's control such as bad weather or customer mistakes.

A parallel indicator is customer satisfaction, measured in terms of level of insurance claims, speed in answering a call, and percentage of perfect transactions. Perfect transaction was introduced in 1995 as a means of attracting attention to the quality of the service at the interface with the customer. Perfect transaction happens when: (a) consignments are collected on time, (b) they are delivered on time, (c) they arrive in perfect conditions, (d) the consignment note is fully completed, (e) an accurate invoice is produced, (f) cash is collected on time. Since its introduction, the percentage of perfect transactions has increased from 57 percent to 87 percent at the beginning of 1997.

Other important indications of depot performance are its ability to retain customers and its performance in customer surveys. Every other year, the principal 4000 customers are asked to rank the service they have received according to 20 attributes using a 1 to 5 likert-like scale. The result ranks the performance of the 33 depots according to its
customers and highlights the main strengths and weaknesses of each of them. Customer feedback is also sought through a general satisfaction survey that is sent out to 7000 customers every three months.

6.3.2.e. Behaviour alignment

Leadership exercised by the CEO was the key to change in behaviour in all hierarchical levels of TNT. The CEO visualised a customer oriented company which required its managers to adopt a different management style and empower its employees to deliver quality service. A central aspect of leadership was its work with other members of the management team to transform their approach to management.

The CEO set the general strategic lines for improvements and retained a high level of commitment to and involvement with the transformational process. Some of the key actions sponsored by the CEO included the introduction of quality initiatives such as the adoption of the ISO standard and later, the EFQM quality model.

Although leadership was very important in the creation of a culture of commitment and continuous improvement, both managers and workers stated that the most significant cultural change occurred at managerial level while the culture of “getting through” had always been present at the bottom of the organisation. Nevertheless mission statements hanging from many walls are a reminder of the basic strategic principles of the company's culture adopted in 1988. They include: “On time every time”, “We can always improve”, “Honesty and integrity”.

The first customer care programme, called “expressing excellence”, raised the issue of customer care. The attention of managers and employees was directed to the importance of understanding what customers wanted and what they thought of the service they received. Customer interface activities such as handling telephone call were brought to the top of the priority list. The ensuing programme, called “expressionism”, concentrated

18 It refers to the trucks that come from the depots. Each of those has a limit time to reach the PDC.
on the need to improve operational performance. It has succeeded in creating a drive for continuous improvement.

In line with the "expressionism" programme, the organisation is increasingly linking financial rewards to well defined operational goals. For instance, in the PDC the most important indicator of performance is the time it takes to finish sorting because it directly affects the ability of the whole network to achieve on time delivery. Three o'clock is considered a critical time to finish sorting allowing the network enough time to complete delivery before 9 a.m. An incentive to finish on time is provided to PDC workers in the form of bonuses that can increase the average salary by up to 50 percent, based on the time they finish their work prior to the deadline of 3 a.m. The sooner they finish the bigger is the bonus.

Since the system has been implemented, there have been successive records of performance in the PDC. Drivers also had their pay system revised. They are rewarded less in terms of hours spent on the job and more in terms of the amount of tasks executed and the quality of the work. The PDC manager commented:

"The guys in the PDC are motivated by money. When I came they were reviewing the bonus for a million years, there were thousands of reports, but it was going nowhere. We were paying people to do the wrong things. We were paying people to unload trailers and hoped that it was done in time. What do we want? We want people to be finished by the time and how they do it is up to them. If you do that I will give you money. That took a while it was a long way to convince them that it was the right way to move forward."

A number of non-financial rewards or rewards in which the financial element is not the main incentive have also been deployed. The operational teams in the depots (depot manager, traffic operator, supervisors, and administrative people) are rewarded if they can achieve performance targets above their second best ever. Although in financial
terms the rewards are not very significant, managers feel compelled to engage in continuous improvement to meet the competition from other depots.

Individuals also receive performance prizes such as the “regional customer care programme”, which is awarded at a big ceremony; and the “I made it happen for TNT” prize which is awarded to individuals who go out to handle an unexpected situation.

Finally, a further incentive is the promotion system. Almost the totality of the managers have began their careers in the shop floor. Even the most sceptical worker recognises that there is potential to be promoted to the highest rankings.

6.3.3. Process control and redesign

The biggest change to the process of TNT did not happen intentionally but instead was caused by sorting all traffic overnight. Prior to the re-organisation freight spent three days at some point in the network. With the re-organisation came the elimination of this period of storage. Considering the size of daily traffic, which was around 35,000 parcels, the amount of WIP eliminated was enormous.

There was a lot of money in parking up the freight either at the PDC or at the depots... We always thought we were busy. We thought: we must be making money. But we were actually losing money. If you walked here at the same period of the day you would be seeing lots of parcels being loaded and unloaded, now you don’t see anything. Now the parcels are either in the vehicles going to the customer or in the vehicle that has collected it from the customer to be sorted today. We don’t store it anymore and that was a big change.

Shop floors processes in the PDC were later mapped and redesigned. The shop floor was painted to indicate the direction of the flow from infeed to outfeed. Also a policy called “clean floor” was implemented by which non-compatible traffic, that was moved manually, was moved straight from the trailer from where it is being unloaded to the destination trailer without being left on the floor in the interim. This was the final step
towards creating an operation free of buffers where the parcels moved straight from the inbound trailer to the outbound trailer in a continuous flow. The rare interference of senior management in the depots’ processes were due to the introduction of new technologies. The depots’ processes were also affected by the introduction of the ISO 9000 standard which helped the organisation to achieve a standardisation of processes throughout its network.

There is no application of process control (such as the six-sigma paradigm) by operators on the shop floor. Macro-processes, such as the arrival of line hauls in the PDC, are controlled for variation. When process variation occurs, the network quality manager is responsible for spotting the root causes for the variation and proposing a solution. There has been an effort to codify knowledge that can be readily used when routing problems occur. For instance, if a trailer faces a blockage caused by snow on a specific road, the driver calls a 24 hour help desk in the PDC. If the problem has occurred before, a computer database will indicate the previous steps taken to solve the problem. Any successful problem solving experience is added to the database.

The issues highlighted by customer feedback are dealt with in the depots by volunteer groups of around six people who select the project and have one of their members sent to the headquarters to learn problem solving techniques. The responsibility for implementing the project belongs to the employees themselves, who have to produce a weekly report for the operations senior manager on the progress of the project.

### 6.3.4. Organisational processes

<table>
<thead>
<tr>
<th>Co-ordination:</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Flow of information</td>
<td>3.52</td>
<td>0.89</td>
</tr>
<tr>
<td>b. Frequency of communication</td>
<td>3.83</td>
<td>0.91</td>
</tr>
<tr>
<td>c. Openness</td>
<td>3.52</td>
<td>0.97</td>
</tr>
<tr>
<td>d. Helpfulness</td>
<td>3.68</td>
<td>0.80</td>
</tr>
<tr>
<td>Co-ordination general</td>
<td>3.64</td>
<td>0.90</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.85</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Entrepreneurship</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Breaking from past behaviour</td>
<td>3.93</td>
<td>0.84</td>
</tr>
<tr>
<td>b. Striving for continuous improvement</td>
<td>4.24</td>
<td>0.80</td>
</tr>
<tr>
<td>c. Developing personal links</td>
<td>3.90</td>
<td>0.74</td>
</tr>
<tr>
<td>d. Tackling problems and dilemmas</td>
<td>3.88</td>
<td>0.76</td>
</tr>
<tr>
<td><strong>Entrepreneurship general</strong></td>
<td>3.99</td>
<td>0.79</td>
</tr>
<tr>
<td><strong>Degree of change</strong></td>
<td>2.79</td>
<td>1.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Individual influence</td>
<td>3.24</td>
<td>0.85</td>
</tr>
<tr>
<td>b. Eliminating ambiguity</td>
<td>3.36</td>
<td>0.73</td>
</tr>
<tr>
<td>c. Testing</td>
<td>3.33</td>
<td>0.79</td>
</tr>
<tr>
<td>d. Articulation of knowledge</td>
<td>3.50</td>
<td>0.83</td>
</tr>
<tr>
<td>e. Knowledge flow</td>
<td>3.93</td>
<td>0.75</td>
</tr>
<tr>
<td>f. Knowledge concentration</td>
<td>3.49</td>
<td>0.84</td>
</tr>
<tr>
<td>g. Challenging assumptions</td>
<td>3.24</td>
<td>0.73</td>
</tr>
<tr>
<td><strong>Learning general</strong></td>
<td>3.44</td>
<td>0.81</td>
</tr>
<tr>
<td><strong>Degree of change</strong></td>
<td>2.54</td>
<td>1.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall result</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>3.64</td>
<td>0.86</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.68</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Total number of respondents = 42

The tables above show very active bottom processes. The overall result approaches the number 4 on the scale, which indicates that the categories of behaviour considered here, tend to occur very frequently. The high scoring of frequency of communication indicates a high level of interpersonal processes among shop floor workers. The importance of developed co-ordination behaviour cannot be underestimated in a business that operates under a tight time schedule.
People on the control bridge, those that drive the trailer to the correct infeed, and the teams on the shop floor who often need to cover for each other, have to co-ordinate their actions. In the depots there are only a few hours to complete the deliveries before 9 a.m., regardless of contingencies that occur.

Entrepreneurship is also a very developed behaviour. In the aftermath of the removal of the authoritarian manager, the workers from the PDC proposed a great number of small improvements. The new manager said that it was as if “a lid had been removed”, which had formerly prevented people to engage in continuous improvements.

He also recognised that the majority of the changes that had occurred since he had taken over were influenced directly or indirectly by suggestions from shop floor workers. A machine that automatically weight and labels parcels in the origin depot, and a line painted on the back of trailers to prevent workers who are unloading from walking backwards and falling out, are examples of employees’ initiatives.

Some practices such as the adoption of the ISO standard and the investors in people model, are helpful in creating a knowledgeable environment by fostering testing and flow of knowledge respectively. The individual influence and the consequent openness of the organisation to suggestions from all levels, are illustrated by an experience of an LBO:

We had a problem with freight reaching the depot too late. So I met the depot manager and the depot manager to discuss what could be done. They discussed with the people from the Northampton hub and in 48 hours the problem was solved. Now we have four trailers coming in as before we had only two, it makes things a lot easier... We also had to change the working hours of the LBOs in consequence.
6.4. Case 4 - Toshiba Consumer Products UK’s background

Toshiba Consumer Products UK belongs to the giant Japanese electronic goods manufacturer. On the same site where it currently manufactures air-conditioners, another Toshiba division used to assemble microwave ovens. From the microwave oven assembly operations it has retained most of the workforce and the English management. Toshiba also has a television set manufacturing facility in Plymouth.

6.4.1. A brief overview of the evolution of operational performance

Toshiba headquarters opted to terminate its microwave assembly operations in the UK in 1990 when the demand for its microwave ovens collapsed. This was due to health scares linked to microwave cooking coupled with large retailers creating their own brands using cheaper Korean products.

Instead of making the workforce redundant, workers were temporarily assigned to the neighbouring television plant. Many of them were later sent to Japan to develop new skills related to manufacturing air-conditioning units. They returned a few months later to initiate the assembly of Japanese SKD\textsuperscript{19} kits.

Workers from local shipyards were also hired and sent to Japan to learn the manufacturing processes of copper parts. In November 1991 the first air-conditioner units containing in-house manufactured parts rolled out of the production line. The first year demanded intense learning not only from assembly workers, whose new work cycle was 5 minutes instead of 25 seconds in the microwave plant. Local management and engineering also had to adapt to the methods and standards of the Japanese headquarters and the new plant senior managers.

\textsuperscript{19} Semi Knocked Down.
6.4.2. Managerial processes

6.4.2.a. Gap closing

A retrospective look at the evolution of the expertise in Toshiba shows three distinct phases of the evolution of performance in the company. An initial focus on the quality of the product was followed by a concentration of efforts and available resources on the improvement of productivity. Finally, efforts were directed towards increasing both delivery and product range flexibility.

Although flexibility became a priority much later, the early decision of reducing dependency on suppliers by manufacturing as many parts in house as possible, was a very important step towards becoming more flexible to customer demand. When demand peaked, it represented a strategic advantage over other Japanese competitors who also had plants in Europe but were more dependent on external suppliers and thus less flexible in their ability to react to variations in demand.

Senior Japanese managers were initially concerned with developing work force skills necessary to meet rigid quality standards. Every unit produced was carefully tested. Those which presented a problem, even a small one, were stripped down to identify what the problem was.

The gap closing objective set by management was to match the quality level of the parent plant (Fujy works) products. Management made sure that everyone understood what the objectives were. This phase lasted for about one year. Meanwhile, the sales company, TUK, was not marketing Plymouth’s products. Consequently the plant was not under pressure to increase output. By the end of the first year of operations quality levels had reached Japanese standards and the plant was ready for the second phase.

With that [matching Japanese quality levels] achieved, it was time to go for the second objective: increase the factory's productivity.
Pushed by more aggressive marketing of its products by TUK, demand began to go up. To keep up with demand a second shift had to be organised. This meant a large intake of new workers. Quality standards fell, but were compensated by stricter final quality checks to avoid affecting the quality of the final product. The increase in production volume accelerated the learning curve. Processes’ bottlenecks, which were not apparent before, were becoming evident and were being dealt with by the engineers.

In the low volume (55 units) the bottlenecks weren’t becoming obvious, but as soon as the demand increased you have to eliminate them and you need to consider further capital investments. And some are very expensive.

Managers took two key actions to improve productivity. First, the maintenance department was merged with the manufacturing department. Through the principle of preventive maintenance, faults were logged in a data base which provided a checklist which operators went through periodically.

Senior management not only encouraged the formation of small improvement groups on the shop floor, but also got personally involved in the setting up of initial ones. These groups were similar to QCCs but geared towards increasing productivity. Furthermore, a number of extra engineers were appointed to speed up the rate of improvements. In spite of having a very active role, management avoided direct interference. ‘Tom’ Nynomia said:

I have appointed additional engineers to improve productivity and they have to handle by themselves. They have to find out how we can improve with small investment, changes in the processes, changes in the jigs, etc. I sometimes suggested to them but if I demand they will adopt a submission attitude and be waiting for me, instead getting some improvement by themselves and that is not good to put productivity up.

After the achievement of compatible levels of productivity and a returning to operating a single shift, the Japanese senior member felt that the time was appropriate to set a new
strategic objective: to become more responsive to customer demand. In other words, the attention of managers and workers should be directed to finding ways to reduce the difference between production and demand.

The management team responded to the new strategic direction by reducing the batch size from 100 to 25. The size of the batches was reduced within a short time span and immediately caused the levels of WIP to go up in the parts shop. Team leaders argued that it was virtually impossible to produce the number of parts for only one batch at a time because the set up times were too high. They therefore adopted a defensive attitude and began to produce parts for more than one batch at a time.

This led to an intensive learning about how set up times could be reduced. Operatives were sent on external courses on set up reduction and the processes were checked for non-added value activities. As a result, set ups that formerly took fifteen minutes currently take only two minutes.

The plant manager said that the ultimate objective had always been the same: to produce one unit at a time, whether this was attainable or not. The different priorities adopted in the process were steps in that direction. The management in Toshiba did not see continuous improvement as the only path to achieving such a goal. A major change in production processes had already been tested that would allow the organisation to produce in cells instead of lines.

A very important element of managerial discretion was to give timing and focus to efforts of all members of the organisation. In the eyes of British managers and workers, Japanese senior managers were very focused in the objectives they wanted to achieve. They targeted a feasible objective and worked consistently towards it. They directed the efforts of the whole organisation to this goal. Defining priorities and working consistently towards them were considered by Japanese senior manager to be the key, he said:
People here [in England] are so ambitious but have no time scale. It is easy to say that we want to achieve that. But you have to make priority. It is very important to define priorities.

6.4.2.b. Management style

In Toshiba, managers are very approachable, and they sponsor the empowerment of lower hierarchical levels. Members report that the egalitarian culture is stronger in the air conditioner plant than in the neighbouring TV plant. One important indication of the distinctive managerial style of the air conditioning division is that even senior managers wear ordinary working jackets, whereas the managers in the television plant do not. Moreover, all managers have their desks in open-plan room so that they can be approached at virtually any time.

Middle managers tend to regard the Japanese senior member as an authoritarian figure. They say that they can rarely challenge his decisions and that he can interfere in every department.

Initially not everyone could understand [what I was saying] and that was very frustrating for me. Then I had to be a dictator. But now gradually I am changing. I still feel frustrated sometimes. Two steps ahead, one step back. They still need to change.

The implementation of shop floor changes now receives a great deal of input from operatives. On the occasion that we visited the shop floor, a layout was being set up for a new line based entirely on guidelines put forward by the operatives. The culture of empowerment took off when the organisation needed to improve productivity. This phase represented a change in managerial attitudes, although management recognises that workers’ suggestions were put aside for a while when the order book was too busy. Management acknowledged that it should not happen again.

Initially management was busy reaching the quality goals and satisfying the sales, it wasn’t until we could sit back and does some analysis with
more emphasis on productivity and started to listen to the members
because the members that were involved with the processes could make
meaningful suggestions

6.4.2.c. Senior management team work

The relationship between the British and Japanese managers was initially difficult
because of cultural differences and a lack of confidence on the part of the Japanese in the
abilities of the British managers. It was the Japanese managers who took the first
decisions regarding outsourcing and equipment acquisition.

Neil Lancaster and me spent a lot of time trying to put our own
interpretation in what they wanted to do. They say you will have a laser
and we would say that perhaps we buy a British, but they would say that
we have a plan and you will live with that. At the initial days we couldn't
have any input, no ownership, no control. It lasted about two years.

As managers developed new skills and proved themselves to be up to the standard
demanded by the Japanese senior member, confidence began to grow. 'Tom' considers
the current management skills to be higher than they were five years ago. Thus
increasingly there is ownership by British management over important decisions such as
reducing the batch size.

The achievement of effective teamwork at managerial level is considered to be very
important. People should understand each other's intentions. As the senior manager
explained: "If I say something, I should not explain all items in detail. You should know
what to do". A key to the achievement of teamwork is to develop frank and good
communications among managers. 'Tom' said:

Today I can say things like we should concentrate on this model by
volume criteria, for instance, but I only suggest.
The plant's organisational structure is divided into three main areas: manufacturing, warehousing (supply and storage), and engineering. Above these come the British and the Japanese senior managers. The relationship among the British managers is said to have always been good. The sales function is executed by TUK, an independent company. When asked if there was any need for a close relationship with the sales director, 'Tom' replied: 'We are always in contact. He has to be like a brother to me... of course'.

6.4.2.d. Performance control

Relevant shop floor indicators such as process times, stocks, and WIP are measured and logged into the plant’s computer system. The operation’s superintendent and senior manager use these indicators to keep track of the performance of operations. However, the Japanese senior manager said that "detailed" measurement was not important for him, but input and output were.

Financial measures are important. I sometimes see things like WIP in order to give them a hint from my experience. Sometimes I give detailed instructions. But I don’t follow many items. Instead I only need to go around in the factory to know if there is something wrong. By listening to rhythmical noise I can say if there is improvement or not.

Target management is used throughout the organisation. The plant management team defines the objectives and sends them out as a formal contract to Japanese headquarters. The plant is left to its own devices as to how to achieve the targets it has set itself.

We submit our plans to Japan and we are expected to work towards it. If the market changes it is not acceptable that you do not achieve your price targets. There is quite a discipline. It turns back on you sort of way.

These objectives are then filtered down through the organisation. The manufacturing manager receives his objectives and gives production superintendents specific tasks for which they engage team leaders. Objectives are demanding. A superintendent comments:
One of my objectives was to reduce the manning in each of the lines by one. In that way productivity can go up. I've got five team leaders and I had to involve all five we had to work as a team and they came up with new ideas about how we could reach the objectives. Other objective was to open a new line without provoking much disruption and train the people that were going to man that line. That is not an easy task. To keep quality and productivity at the same time may be out of my reach.

Sometimes, objectives appear to be contradictory. One example is an insistence on maximising the output of machines at the same time as minimising batch sizes. This seems to contradict the observations of members on their trips to the parent plant where they found machines left idle in the name of little inventories. Japanese management explained that there was no contradiction because there is still too much muda and room for improvement.

6.4.2.e. Behaviour alignment

The history of the organisation has had an influence on how workers perceive their relationship with the company. A strong bond with the company was created when nobody was made redundant during the transition period in which the microwave oven plant was closed prior to the set up of the first production line of air-conditioners. Also, the very strict initial training in the first year of production helped to create a culture in which people achieved high standards.

The initial conditions of the air-conditioning operations were defined by traits inherited from its mother plant operations in Japan and from the Toshiba corporations as a whole. Because the plant's managerial behaviour and organisational systems reflected those developed over many decades of lean production in Japan, there was no need for very significant changes. An example is the development of a multi-skilled workforce linked to the reward system. A multi-skilled work force is a common characteristic in any Toshiba operations, as are participative management style and an empowered workforce that make use of QCCs.
One important facet of leadership in Toshiba was its sponsorship of the development of a strong culture of continuous improvement and teamwork. ‘Tom’ Nynomia has led the plant since it was set up. He is responsible for the overall performance of the plant whereas the senior British manager, Neil Lancaster, is responsible for running the operations.

The Japanese senior manager regards teamwork as one of the elements that the organisation lacked at the beginning and needed to develop. According to his vision, middle managers have to be fully integrated into this culture first before they are able to lead members. He sees improvements on the shop floor as dependent not only on changes to shop floor processes but also on the evolution of management skills. He commented:

Productivity means not only shop floor. Engineering productivity means that they have to improve their skills... very important. What you are saying is a narrow definition; I have a broader view.

Managers are always expected to achieve a bit more improvement. “If I as a manager am satisfied with how things are, I am not useful to the organisation anymore”, said the senior manager. In its five years of history, the organisation as a whole has constantly searched for ways to improve its capabilities or to eliminate muda. There has not been a long period where significant improvements have not happened.

The culture enjoyed by the company is an effective substitute for supervision. The two production superintendents, one for the parts shop and other for the assembly shop, are on the top of a flat structure of only two hierarchical levels: team leader and members, but they have never felt the need for more supervision. The adaptation of workers who came from the dockyards into this committed culture of self-empowerment did not occur without difficulties.

Toshiba is a culture shock. They come from a background that they don’t really understand what factory life is all about. It is also a Japanese
thing that to have the control of the place you need to have everybody understanding what they are responsible for... What I have learned was to take more responsibilities because there are not many people in charge. If you are a school leaver you get it quicker, but when you are used to another way you suffer.

A second important facet of the leadership exercised by Tom Ninomya is the combination of clear objectives together with the timing of the introduction of these objectives, thereby allowing the organisation to pursue one objective at a time. All members at all hierarchical levels are made aware of the organisation’s goals. One striking feature of the strategic process in Toshiba is the fact that and efforts of members at all levels are always aligned with specific operational objectives prioritised by management.

6.4.3. Process control and redesign

Toshiba adopts a process control that is close to the six-sigma paradigm. Machine operatives are in charge of checking elements described in a process sheet which can be dimensions of the part being manufactured or visual inspections. There is no use for SPC. Instead there is a reliance on visual control because variation in the processes should become visually evident. Workers are constantly working in QCCs or collaborating in engineering projects to promote changes in the production line.

As Toshiba attempted to become more flexible (in terms of both range and delivery) it realised the need for a holistic view of its process. The reduction of the batch size to 25 units caused a number of disruptions in the assembly shop because the parts shop could not supply the parts in time. After an initial tendency to blame people, management realised that it was necessary to understand the various factors interfering with the stoppages.

We have to understand what the problem is until we can do anything. The problem is we don’t really know what is the real reason for these stoppages. The reports say in September the parts shop stopped for that
but it wasn’t just the parts shop there are a lot of things involved. There was a lot of breakdown. Was it because maintenance couldn’t service the machine, because of lack of training because they never had the skill card?

It was agreed that every time there was a stoppage, the three areas (manufacturing, engineering, and warehouse) should make a report of the causes. This should be sent to the department concerned who should comment on them. The objective of the effort was to “getting an idea of the influences”, that could provide the grounds for “flagging up problem areas”. In this sense, the ability to become more flexible was directly linked to a knowledge of the factors influencing the functioning of the production line.

Each model may represent a different problem in the paint shop, or in the brazing shop, or the press shop. Therefore it is very difficult to achieve a balance. We have a long way to go to understand the relationship model by model, machine by machine. I think that if we knew more about it we could meet more of our customer demand without too many problems

The organisation found it too difficult to establish the cause-effect relationships. Instead it opted to identify the micro-areas where the problem originated and to make the managers of that area accountable. But some cause-effect could be observed and could help define certain procedures.

For instance, it was realised that whenever two complex products were scheduled to be produced in parallel, the production lines tended to jam. The solution was to schedule complex units in parallel only with simpler ones. It has been observed that the rate of introduction of new models was also a factor affecting the performance of the production line.

When you do one new model a month it is OK but when you try to do 5 or 6 it is a bloody nightmare.
Continuous improvement of the processes will soon be complemented by their redesign through the introduction of cell production. Eight parallel cells, manned by three or four people replacing three production lines will increase the ability to produce different types at the same time. It will also provide opportunities to reduce the batch of 25 even further. Management also sees advantage in the fact that it eliminates problems of balancing lines to produce different models, and diminishes the disruptive impact of absenteeism and vacations.

6.4.4 Organisational processes

<table>
<thead>
<tr>
<th>Co-ordination</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Flow of information</td>
<td>2.80</td>
<td>0.75</td>
</tr>
<tr>
<td>b. Frequency of communication</td>
<td>3.18</td>
<td>0.81</td>
</tr>
<tr>
<td>c. Openness</td>
<td>2.61</td>
<td>0.82</td>
</tr>
<tr>
<td>d. Helpfulness</td>
<td>3.43</td>
<td>0.73</td>
</tr>
<tr>
<td>Co-ordination general</td>
<td>3.01</td>
<td>0.84</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.24</td>
<td>1.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entrepreneurship</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Breaking from past behaviour</td>
<td>3.35</td>
<td>0.74</td>
</tr>
<tr>
<td>b. Striving for continuous improvement</td>
<td>3.48</td>
<td>0.87</td>
</tr>
<tr>
<td>c. Developing personal links</td>
<td>3.11</td>
<td>0.75</td>
</tr>
<tr>
<td>d. Tackling problems and dilemmas</td>
<td>3.20</td>
<td>0.67</td>
</tr>
<tr>
<td>Entrepreneurship general</td>
<td>3.28</td>
<td>0.77</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.27</td>
<td>1.14</td>
</tr>
<tr>
<td>Learning</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>a. Individual influence</td>
<td>2.48</td>
<td>0.81</td>
</tr>
<tr>
<td>b. Eliminating ambiguity</td>
<td>2.43</td>
<td>0.79</td>
</tr>
<tr>
<td>c. Testing</td>
<td>3.31</td>
<td>0.68</td>
</tr>
<tr>
<td>d. Articulation of knowledge</td>
<td>3.03</td>
<td>0.84</td>
</tr>
<tr>
<td>e Knowledge flow</td>
<td>3.31</td>
<td>0.61</td>
</tr>
<tr>
<td>f Knowledge concentration</td>
<td>2.56</td>
<td>0.79</td>
</tr>
<tr>
<td>g Challenging assumptions</td>
<td>2.30</td>
<td>0.73</td>
</tr>
<tr>
<td>Learning general</td>
<td>2.77</td>
<td>0.85</td>
</tr>
<tr>
<td>Degree of change</td>
<td>1.98</td>
<td>1.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall result</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>2.97</td>
<td>0.85</td>
</tr>
<tr>
<td>Degree of change</td>
<td>2.13</td>
<td>1.09</td>
</tr>
</tbody>
</table>

Number of respondents = 65

Co-ordination behaviour is helped by a number of shop floor practices. Team leaders are briefed daily by superintendents, and then hold briefings with their teams. Team leaders from parts and assembly shops communicate frequently in order to define a common approach to meeting the manufacturing orders of the day. The people on the shop floor perceived their colleagues as very supportive. This corroborated the high scoring of the helpfulness item. In fact, the change from long production runs to shorter ones contributed to making people more dependent on each other.

The reported commitment to shop floor culture is highlighted by the high scoring of the entrepreneurial behaviour which indicates a strong pursuit of continuous improvements and an openness to change. Learning behaviour was partially jeopardised by the fact that many suggestions that came from the shop floor could not be implemented because the organisation was too busy fulfilling the order book. Also, the ability of individuals to
influence the production process is limited by the fact that most of the design of the units is still made in Japan. On the other hand, testing and documentation are supported by the implementation of the ISO 9000 standard.

In this chapter we have described the current state and an account of the variation of the following variables:

- Managerial processes: Gap closing, management style, senior management teamwork, performance control, and behaviour alignment
- Process control and redesign
- Organisational processes: co-ordination, entrepreneurship, and learning

The next chapter is dedicated to cross case analysis. We draw from the within case analysis presented here to identify what is common among the cases and what is different. These findings are then linked with the issues from the literature.
Chapter 7 – Cross Case Analysis

In this chapter we finish the data analysis by performing the cross case analysis and begin the data treatment that will be concluded in the next chapter. At the beginning of the chapter we discuss the role of managerial rationality in the strategic process, supporting the arguments with the cases' commonalities. We then perform the formal assessment of the cases' similarities and differences. The chapter closes with the discussion of gaps in the literature presented in 2.16. in the light of the findings.
7.1. Cross case analysis

In this chapter we draw conclusions based on the four within cases analysis presented in the previous chapter. Before proceeding with the similarities and differences analysis, we focus on one of the central issues of this research: the role of managerial rationality. A new piece of literature by Ocasio is introduced. Two factors account for this late introduction. Firstly it was published recently (1997). Second, it only became relevant when the research was already advanced. Ocasio’s (1997) model suggests that what will be achieved by the organisation is dependent on the ability of managers to focus the attention of the organisation on particular issues. We found this perspective particularly useful to articulate and substantiate our field observations.

Below we describe the dialectical relationship between managerial action and the initial conditions of the organisation. We consider the impact of particular decisions, but emphasise a processual perspective. By adopting a processual perspective, we can add to Porter’s notion of the duality between managerial rationality and actions. What is important is not only what managers decide but also what they routinely do. The next step is a formal assessment of the similarities and differences between the four cases. We close the chapter by using cross case conclusions to answer the literature review chapter’s questions which relate to the literature gaps.

7.2. Managerial choices and initial conditions

Porter’s dialectic view of the process of strategy as depending on the interaction between managerial choices and initial conditions, could lead us to conclude that in the process of performance evolution, managers rationally address initial conditions. In other words, we should expect a direct relationship between the rationality of the management team and strategic outcomes.

However, from the beginning of the field research, it was clear that the outcomes achieved by the companies we studied did not result from a ‘grand design’. We were
forced to consider the possibility that there is no connection between formal intention and outcome. This view is supported by a number of authors, such as Mintzberg who advocate that outcome and intention are not related. They argue that managers do not engage in a search for strategic plans. Rather, strategic outcomes are achieved through daily interaction between managers and the initial conditions.

Our findings suggest a middle ground. There is a connection between intention and outcome. Managers determined end states and sometimes defined actions to be implemented by middle managers. But the relationship between intentionality and outcome is not always direct. It is more complex than the traditional view\textsuperscript{20} that managers at the top identify the gap closing objectives and the necessary actions, and only communicate them to middle managers who are responsible for implementing the strategy.

We consider the relationship of senior management discretion with outcomes to fall into three categories. The first category is the one that is closer to the traditional view. Strategic planning exercises result in a ‘grand plan’ which details a number of actions which should be implemented. There is a direct relationship between managerial rationality and outcome. Other organisational members participate little, other than carrying out instructions. This category is usually about "hard" decisions such as market positioning or structure design. In the table below we list some of the design elements of each case.

The second category, in a decreasing order of direct relationship between rationality and outcome, relates to how managers engage in the search for a desirable end state of performance. Management identifies what the strategic problem is, and the gap-closing objectives where the strategic effort should be concentrated. But this is as far as planning goes. Senior managers do not define detailed action plans from the outset. Lower hierarchical levels are given the responsibility of defining the course of action.
One of the important elements of planning in SERASA was the implementation of the quality programme. Although senior management envisioned a desired end state in consequence of the implementation of TQM, such as the dramatic improvement of business processes, it did not define the course of action or even the time span. The quality department and middle managers were responsible for the decision making.

Although CIGNA’s management decided to organise the production in cells, which led to a change in the production processes, the new business processes were not designed by management. Management defined the levels of performance expected from the new business processes, which emerged through trial and error.

<table>
<thead>
<tr>
<th>FIRST PHASE</th>
<th>SECOND PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERASA</td>
<td></td>
</tr>
<tr>
<td>• Flattening the organisational structure by eliminating several positions</td>
<td>• Replacement of functional structure by matrix</td>
</tr>
<tr>
<td>• Creation of four main areas with parallel development areas</td>
<td>structure</td>
</tr>
<tr>
<td>• Implementation of a planning system</td>
<td>• Creation of process complete cells</td>
</tr>
<tr>
<td>CIGNA Closing down facilities and moving to Scotland</td>
<td>• Defining levels of performance</td>
</tr>
<tr>
<td>• Market redirection</td>
<td>• Structural changes</td>
</tr>
<tr>
<td>• Redesign of customer interface</td>
<td>• Adoption of EFQM model</td>
</tr>
<tr>
<td>• Fostering customer care</td>
<td></td>
</tr>
<tr>
<td>TOSHIBA</td>
<td></td>
</tr>
<tr>
<td>• Grading system aimed at developing multi-skilled workforce</td>
<td></td>
</tr>
<tr>
<td>• Substitution of imports by in-house made parts</td>
<td></td>
</tr>
</tbody>
</table>

Table 7.1 – Actions by design

The first phase of the change process in TNT defined a number of desired end states, such as customer focus, cost control, and investment in technology. The organisation embarked on the second phase of the strategic process using the EFQM model as a guide when the first phase was concluded. The model provided a framework of desirable end states, such as empowerment and a continuous improvement culture. The end states

---

20 That is also the MSM view.
envisioned by Toshiba’s management are those that characterise a lean producer. The strategic process was divided into three phases where the focus was placed exclusively on a specific performance attribute at the time.

This category acknowledges that managers address only a limited number of issues. They cannot account for all the decisions involved in the transformation of the organisation. The concept of bounded rational managers is extensively developed by a number of important researchers such as Cyert and March (1963) and Mintzberg (1990, 1994).

The third dimension of managerial intervention gives even more emphasis on emergent and processual aspects while still recognising the link between intention and outcome. Managers can determine the course of change not by taking decisions themselves, or even by only determining end-states, but by influencing the way in which the organisational members will take decisions. This is done by drawing the attention of all the decision-makers in the organisation to a certain number of issues and providing them with legitimised answers to deal with those issues.

<table>
<thead>
<tr>
<th>FIRST ORDER INITIAL CONDITIONS</th>
<th>SECOND ORDER INITIAL CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SERASA</strong></td>
<td>○</td>
</tr>
<tr>
<td><strong>CIGNA</strong></td>
<td>♦</td>
</tr>
<tr>
<td><strong>TNT</strong></td>
<td>○</td>
</tr>
<tr>
<td><strong>Toshiba</strong></td>
<td>♦</td>
</tr>
</tbody>
</table>

Figure 7.1 – Rationality and the initial conditions of the organisation

- ● Senior management identifies end state and sets the repertoire of actions.
- ♦ Senior management identifies end states.
- ○ Senior management defines issues and answers.
- □ Developed without connection with the strategic process.
7.2.1. Indirect rationality

The evolution of performance is the result of an enormous number of actions taken by all decision-makers inside the firm. Decision-makers exist at all managerial levels. In companies that empower lower hierarchical levels, even shop floor operatives may take decisions of some importance. The empty circle highlights those initial conditions whose transformation excludes detailed planning and defined end states. The dominance of the empty circles in the figure above suggests the importance of the process of strategy which is separated from the content of strategy.

Simon (1947) saw senior managers influence the process by “allocating and distributing the stimuli that channel the attention of administrators in terms of what selected aspects of the situation are to be attended, and what aspects are to be ignored”21. Senior managers influenced the process by directing individual decision making throughout the organisation. Managers set the focus of attention and then worked to influence the context in which members are included.

According to Ocasio (1997), the focus of attention is set by the definition of issues and answers. This means respectively the definition of mechanisms for making sense of the environment and the repertoire of possible actions that decision-makers should consider. We observed that the models included elements that indicated corporate concern (e.g., profit, survival, etc.), marketing objectives of the business unit (focus on attributes of performance that are important for targeted customers), and strictly operational issues (e.g., elimination of bottlenecks). SERASA and TNT used the quality model as a base to define and legitimise the issues and answers proposed by management. CIGNA’s issues and answers model was grounded on study that defined gap-closing targets in terms of service attributes and costs, and in the organisation’s experience with reengineering projects brought in by the change team. Toshiba’s answers and issues were directly associated with the Japanese mother plant’s lean production practices.

21 Quoted from (Ocasio, 1997).
Unlike other cases where the change focus was on broader organisational change, Toshiba's issues and answers were almost exclusively related to operational issues. This operational focus was possible because there was no need to effect a deep transformation of the second order of initial conditions. Systems and structure were already compatible with the lean production environment.

TNT managers realised that it was necessary to not only give visibility to issues and answer but to legitimise them. When the non-premium three day traffic was eliminated, management faced fierce resistance from depot management. They refused to “kill” the undesirable traffic because they did not see it as a sound strategic move. A senior manager said:

> Now we know how important it is that everyone is convinced. You can feel the difference on the people on the depot. When their boss is convinced of the strategy they work much better... You cannot convince people by bringing them all to a forum.

All four cases have in common the fact that managers provided a model of issues and answers during the strategic processes and made them available throughout the organisation. The organisations that could not import a consistent and legitimised model from headquarters, such as Toshiba and CIGNA, found in the quality model a very useful substitute.

The quality model provides a consistent framework of issues by giving a clear idea of the relationship of the organisation and its processes to its environment. It also provided answers, by focusing attention on process improvement, empowerment, and appropriate managerial behaviour. Furthermore, it has the legitimacy of being generally accepted as “the” right model for organisational improvement. The prestige of national awards, that has a high profile in the press and in society, reinforces the legitimacy of the model.

We observed that issues should be limited to only a few to avoid dilution. In the cases studied, managers were careful to limit the relevant issues and answers proposed. Toshiba
is a case of special interest. The issues and answers directly related to shop floor performance were focused on only one dimension of current performance.

Toshiba did not begin the process by emphasising issues and answers to quality, productivity, and flexibility all at once. The result would have been a confused message from top management about what was expected from those in the shop floor. By providing legitimised answers to consistent issues, senior management could directly influence shop floor behaviour and performance.

The need to limit the number of issues that the organisation can deal with successfully, is closely related to the notion of trade-off. Organisations can only cope with a limited number of issues. Thus setting issues that are either contradictory or that divide the attention of decision-makers, leads to poor outcomes. This helps to explain why the organisation cannot pursue improvements in all performance areas at the same time.

7.2.2. Attentional structures and decision channels

To define a model of issues and answers is not enough. Senior managers have to transform the organic functioning of the firm to induce continuous focus on their proposed model. The necessary change includes what is more complex than the redesign of structure and managerial systems. To adapt mechanisms of the firm to its new goals is an essential step; but change should be more encompassing and seek an intrinsic alteration by managing managers’ behaviour. The nature of the managerial processes will define whether or not the strategic process will follow the issues and answers model adopted by the firm.

Below we provide Ocasio’s (1997) description of attentional structures and decision channels. These two concepts are associated with our managerial processes. Gap closing, management style, senior management teamwork, and performance control are the processes that define the shape of the decision channels. These processes considered

\footnote{Ocasio (ibid.) calls it procedural and communications channels.}
together define how the members of the organisation interact with each other, both laterally and vertically, and how decisions are taken. They define the "formal and informal concrete activities, interactions, and communications set up by the firm to induce organisational decision-makers to action on a selected series of issues". Ocasio (1997) adds, "the particular form and characteristics of the firm's procedural and communication channels significantly impact when, whether, and how decision-makers focus their attention, and how the attention of the various decision-makers interacts within the channel".

How business processes were controlled and redesigned in the case studies also played a part in shaping the channels of interaction. Process control identifies issues on which members should focus. Process redesign, especially the creation of teams, greatly changes how members interact.

Behavioural alignment is the managerial process that refers to how managers shape the attentional structures, defined by March and Olsen (1976) as the social, economic, and cultural structures that will determine the focus of attention, time and effort dedicated by organisational decision-makers. Ocasio (1997) argues that attention structures will mediate "the valuation and legitimisation of issues and answers, the creation and distribution of procedural and communication channels, and the interests and identities that guide decision makers' actions and interpretation". He examines the role of four categories of attentional structures: rules of the game, players, structural positions, and resources. We present definitions of the categories below because they will facilitate the discussion of role of behavioural alignment.

The rules of the game "provide a logic for action and embody a set of cultural and material values and incentives" (ibid.). They link financial and social rewards to specific issues and answers, thus regulating behaviour in the organisation by dictating how members achieve social status and credit, and are rewarded in the process of achieving organisational objectives.
The rules of the game are dependent on the historical context in which they develop. By shedding all its senior managers, SERASA facilitated a change in the rules of the game by diminishing the importance of history. Reward systems also carry the previous history of the organisation and are transformed and realigned with operational objectives. One important difference between Toshiba and the other cases is that the “rules of the game” were not changed but built over the existent platform of lean production.

Ocasio also distinguishes decision makers from players on the grounds that players are those who “through their social influence, power, and control, influence and regulate the decisions and activities of other decision makers”. We have identified the role of players by isolating the leadership aspect. All four organisations had a leading figure who had a profound influence on the focus of attention of members.

Structural positions differentiate the attention of decision-makers. Vertically, a manager should have a different perspective of the issues and answers than workers, while horizontally a marketing manager may have a different view from that of a production manager. The smaller this divergence is the better the whole organisation can focus on a unique set of objectives. The search for flatter organisations in all cases reflects this need. Again, only Toshiba was already ‘born’ as a flat organisation.

We should expect consistency between attentional structures and decision channels. In other words, we should expect consistency among the managerial processes that make up these two categories. This is in fact one of the hypotheses that was proposed in chapter three.

7.3. Cross cases similarities

Search for end goals of organisational transformation - The transformation achieved in the four cases has sound roots in intentionality. CIGNA, TNT, and SERASA are best

23 Resources were not found to have any correspondence to our field observations.
described as processes of strategic turnaround while Toshiba is an example of evolution. Nevertheless senior managers in all four companies engaged in the search for specific end states and worked towards achieving them.

TNT and CIGNA initially implemented action plans in reaction to a declining competitive situation that was threatening their very survival. A second phase followed in which the search for strategic end goals occurred. The strategic objectives defined by senior managers went far beyond the definition of operational performance gaps. Managers wanted to achieve major alterations in the nature of the organisations which went beyond shop floor transformations. Nevertheless, the definition of operational gap closing objectives gave an important sense of direction to the organisations' efforts.

CIGNA and Toshiba defined gap-closing goals during the planning phase. CIGNA performed an extensive survey of its customers. This resulted in a reasonably precise definition of gap closing objectives in terms of how its performance was perceived at that time and the standards desired by its customers. Toshiba managers arrived from Japan with a clear idea of the appropriate levels of quality24, dependability, productivity, and flexibility. SERASA and TNT used customer responses to define gap-closing objectives at various points of the process.

**Successful implementation - No U turns in strategy** – The combination of a few critical choices, defined in the planning phase, and successful implementation were common to all cases. Managers made few strategic choices and were able to build enough momentum within the organisation to keep the change process on course until objectives were achieved. Although resistance was common, in none of the cases were senior managers forced to reassess original objectives and to reverse decisions, which would have been unavoidable if the change process had been brought to a complete halt.

---

24 Quality could be directly compared with the standards of the mother plant. In fact matching the quality of the mother plant was proposed as the first gap that should be closed.
In the example provided by SERASA, management aimed at three concrete goals: (1) the development of a planning system that involved the whole organisation in the business strategy formulation process, (2) the redesign of the organisation into a flat structure, and (3) the implementation of the TQM ideas throughout the organisation. Although the achievement of these objectives could not guarantee strong operational performance, their implementation provoked deep changes in the organisation, making it compatible with the goals of strong performance.

TNT successfully redefined its market niche. This decision, associated with the decision to create a customer-focused organisation, based on the implementation of TQM systems, proved essential in the evolution of operational performance. CIGNA's strategic choice was to organise production in cells. The success of this move concentrated most of the managerial attention for a long period. Toshiba's essential strategic choice was to select one attribute of performance at a time. Management would be fully committed to a certain attribute such as quality until they had achieved appropriate levels.

Adapting the management style - The style of both middle managers and senior managers underwent adaptation during the strategy process. The degree of change, however, varied according to initial conditions. Toshiba, for instance, was the case in which observed mild changes are explained by the fact that its operations were born within a lean production organisation. Other organisations had to struggle to change incompatible managerial behaviours.

The change in managerial behaviour in SERASA began with the replacement of the management team. Supported by the acceptance of TQM principles, senior managers worked towards transforming the behaviour of middle managers, who initially felt threatened and resisted the change process. Gradually middle managers adopted the roles of facilitators instead of supervisors.

Similarly in CIGNA the change of management style began from the top. The authoritarian MD was replaced by a new manager, with a recognised participative and
coaching style. The change team interviewed senior managers to assess their willingness to adapt to the new style. Those who could not adapt eventually left the company. Likewise, line management was given training on the new skills required to perform the role of coaches. Those who could not develop abilities necessary to become team leaders were assigned a technical role.

Although none of TNT's senior managers disputed the necessity of implementing changes to regain competitiveness, they were less keen on changing their own management style. The CEO initially campaigned to change the behaviour of senior managers using principles of the quality model as a paradigm. A strong change in attitude was experienced by the whole organisation as the senior managers in TNT Express changed their style and this change filtered down to lower hierarchical levels. Before this change in attitude, employees could be sacked if they disagreed with senior managers. This attitude was gradually eliminated and middle managers were given a great deal of discretionary power.

These empowered middle managers reflected their new role in their attitude to subordinates, bringing the change in attitude closer to the shop floor. A manager who was able to create an atmosphere of empowerment, replaced the PDC’s authoritarian manager. These changes are still in process, because section leaders (former foremen) in the PDC have to be yet fully converted from a supervisory to a coaching role.

Toshiba’s case demanded less adaptation because management style had already been integrated into a lean production culture. Most of the participative management practices have evolved over the years rather than undergoing significant change. There has always been sponsorship of an egalitarian culture with no offices and common dress, and the involvement of members in shop floor decisions. The most significant change occurred at the senior management level. Since British managers proved to have the managerial capabilities required by the Japanese senior manager, they were increasingly empowered.
Active senior management teamwork – Another important theme running through the cases was the co-operative behaviour among senior managers. The collaboration between the areas during the change process was dynamic and constant. There were no signs of any major political dispute over resources and power during and after planning.

SERASA assembled its new management team with the philosophy that areas should come second to business processes. This was helped by organisational redesign which brought roles closer to business processes, and through a planning system which allowed and encouraged a great deal of lateral integration between the areas’ lower hierarchical levels. The CEO said that senior managers were never allowed to protect the interests of the functions in opposition to the general interest of the business.

CIGNA knew from other experiences of change that it could not afford to employ senior managers who were not willing to work together. It gradually expelled senior managers who were unable to engage in teamwork. It also eliminated the previous political power of big areas by redefining the organisational chart as a matrix structure. Now the senior managers are responsible for the results of their own line of business. They share responsibility of the production staff with the operations manager.

TNT showed a great deal of teamwork at senior management level by backing the marketing manager in the face of criticism from middle managers when profits momentarily declined because of the new marketing strategy. Operations and marketing directors co-ordinate their actions very closely, avoiding inconsistencies between the traffic accepted by the sales department and the network’s abilities. The relationship between the senior managers is very informal and they circulate in the same space and interact constantly.

Toshiba also enjoys active teamwork among its senior managers. The Japanese senior manager considers it essential that managers have a clear understanding of each other’s intentions and share the same objectives. Co-ordination with sales operations, which is
the responsibility of another Toshiba division, is ensured by the close relationship between the plant manager and the sales director.

**Close control of operational performance by senior managers through the extensive use of measurement** - All four organisations have developed sophisticated methods of performance control, which is an important determinant of the relationship between senior managers and line managers. These metrics did not previously exist and were implemented during the change process (the exception is Toshiba which is not a case of transformation).

SERASA’s internal maxim is “what is not worth measuring is not worth doing”. Aggregated indicators, which measure the advancement of the organisation towards its strategic goals, are followed personally by the CEO and senior managers and are used to define possible corrective action or call the attention of middle managers to specific trends. Non aggregated indicators assist line managers in focusing attention on deficient processes, and in identifying technical deficiencies in the workforce as a whole, or in individuals.

CIGNA initially set performance indicators to keep track of the evolution of the pilot teams. During the early stages of the change process the quantitative measurement demonstrated the dramatic evolution of performance, and reinforced the legitimacy of the change process. The same indicators are still used to track team performance and for target setting. Each week, team leaders and the operations manager have a meeting to discuss the performance of those indicators and the evolution towards targets.

The performance of each of TNT’s depots is controlled by indicators of quality\(^{25}\), operational costs, quality of customer interface, and customer feedback. These measures determine the actions taken and the relationship between senior managers and the managers of the depot. The comparative performance of all depots is published weekly

\(^{25}\) In terms of the depots contribution to the network operations
and those with poor performance are highlighted. Annual targets of operational performance are set in relation to those outcomes which ensure continuity of improvement.

Toshiba’s senior managers define the general targets of the organisation, which are broken down into local targets assigned to managers. Managers are accountable for achieving those targets. This is in line with an important aspect of the relationship between the Japanese senior manager, the British management team, and the superintendents. The senior manager controls the continuous elimination of muda, by demanding constant improvements from managers, not only by checking on shop floor performance indicators but also by periodically inspecting the shop floor.

The importance of strategic leadership - Authors who do not subscribe to a top-down vision of strategy, such as Mintzberg, remind us that it is easy to overestimate the role of leadership. On the other hand, the literature in both academic and popular press has many examples of heroic leadership. Quality of leadership was a prominent facet of the case studies. However, senior managers performed a role distinct from that of heroic leaders, who are perceived as responsible solely for the turnaround processes.

Leadership exercised by CEOs went beyond managerial aspect. Management was understood as providing order and procedures necessary to run the business. Leaders were able to inspire and motivate members by changing their behaviour and unleashing energy towards common objectives (Whittington, 1991). Adopting the same definition as Pettigrew and Whipp (1991), we can say that leadership can have three basic styles: transactional, transformational, and representational. The kind of leadership of interest here is the transformational one.

Transformational leaders focus the attention of organisational members, and by being effective communicators, are able to build commitment and motivate people to trade short-term interests for higher objectives. The transformational leader induces changes by empowering other agents to participate in the process.
Pettigrew and Whipp (1991) assert that most of the time leadership is not regarded within a processual context. Non-processual perspectives tend to focus on specific actions of leaders and disregard history lines. The profile of leadership that emerges from this study is not one of charismatic leaders taking decisive dramatic action. Instead managers, as observed by Pettigrew and Whipp, relied on a great deal of preparatory work to create the right atmosphere and capabilities, and to legitimise actions.

Allowing extensive preparation before any major change of action was a strong pattern in all cases. SERASA's new CEO allowed more than one year of preparations before beginning the implementation of TQM principles. In addition, the redesign of the organisational chart was an initiative to implement the strategic planning system. CIGNA allowed a long period of assessment of its competitive position and choices before taking essential decisions. During this period, the change team interviewed top managers to assess their commitment to the change process. They also explained the rationale for the proposed changes to workers and middle management.

TNT understood the need to make preparations before the implementation of major changes when depot managers reacted negatively to the change in market positioning because they were not convinced of the appropriateness of the measure. In Toshiba, each time there was a change in the strategic direction for improvement, such as from quality to productivity, management was careful to rationalise the need to do so.

In accordance with the pattern observed by Pettigrew and Whipp (ibid.) the style of leadership changed according to its context. The most striking example was CIGNA. Initially an authoritarian MD was considered adequate to initiate the change process. However, this process called for different abilities and management styles and another MD had to be appointed. Once the change process was completed there had to be a further change of MD to appoint someone with the skills needed to run the business.
We also observed leaders to rely on managers throughout the organisation to lead the process at their level. Senior managers opted for developing the management skills of middle managers before enhancing their discretionary power. Without the participation of these 'intermediate' leaders, the change process would have been brought to a stand still.

The bigger the organisation the more important was the role of these “intermediate” leaders. TNT designed special training programmes. CIGNA delegated part of the change leadership to the change team. Middle managers in SERASA were made responsible for the change in their areas. Toshiba’s senior manager regarded it as essential that middle managers learn the necessary managerial skills in order to achieve a culture of continuous improvement.

Redefinition of how members in all levels are rewarded for their actions - Leadership is not sufficient to accomplish complex processes of change. Nadler and Tushman (1990) argue that successful change goes beyond energy and vision. Managers, they say, should also be able to “build teams, systems, and managerial processes”. They also add, “It is this interaction of charisma, attention to systems and processes, and widespread involvement at multiple levels that seems to drive large system change”.

Managers did not generally have a system of incentives. Nevertheless, those managers who did not fit into the new “rules of the game” were gradually removed from the organisations or faced a bleak future. This was true for both senior and middle managers. For instance, a middle manager who was not concerned with achieving a culture of continuous improvement in his/her section could hardly aspire to be considered for promotion and probably would have difficulty keeping his/her position. TNT and SERASA both offered financial incentives to branch managers. However, while the financial reward built into TNT’s programme is only symbolic, in SERASA it represents an important part of the branch managers’ income.

26 Reference: Wittington 1993
The "rules of the game" are defined by monetary or non-monetary systems of incentive at shop floor level. These systems are used proactively to support the achievement of operational goals. SERASA's managers showed a concern about the financial rewards systems saying that they should be implemented only when the organisation is well into the change process. Otherwise they could confuse workers. SERASA applies individual performance appraisal to the level of quality and productivity.

In CIGNA, a team-based bonus was considered important to develop team spirit. Later, it was substituted with a system based on non-monetary rewards and individual development. TNT linked payment to performance in specific areas. A particularly successful example was the implementation of a system where workers received a bonus according to what time prior to three o'clock they finishing sorting.

Toshiba confirms Schonberger's (1986) assertion that "there is little or no room for incentive plans in a WCM mature plant". Nevertheless, the grading system played a role in developing a multi-skilled work force. There were also implicit rewards at Toshiba. Workers who had shown interest in continuous improvement were later promoted to the engineering department or became team leaders.

Behaviour tended to differ in intensity according to the category of behaviour - The companies presented the same general pattern of scoring higher on entrepreneurship, followed by co-ordination and then learning (the means were found to be statistically different). The only exception was CIGNA where co-ordination and learning means were found not to be significantly different (2-tail sig. = 0.134).

The rates of change were perceived to be greater for co-ordination and entrepreneurship behaviour than learning. However, no significant difference could be observed between co-ordination and entrepreneurship. This suggests that change in managerial behaviour and the modification of organisational systems might affect co-ordination and entrepreneurship in a similar way. It indicates that the consequences of the alterations of managerial processes have a more straightforward effect on co-ordination and
entrepreneurship than they have on learning processes. Thus learning behaviour may tend to be more inertial than co-ordination and entrepreneurship, take longer to react to organisational change, and thus be more time dependent.

**Strong evolution of the production processes towards leanness** - All companies presented high scoring on dependency, meaning that sequential tasks presented little or no buffer among themselves. We argue that dependency is a good representation of the degree of leanness of the production processes. The fewer buffers\(^{27}\) there are separating production stages the more dependent people have to be on each other's performance.

As a simple example, consider two similar production lines in which one has a great quantity of WIP between the parts shop and the assembly shop and the other has very few or non-existent WIP. It is clear that in the second case, workers in the assembly shop will be more dependent on those in the parts shop than in the first case.

The mean average score of dependency for all companies considered together is 4.15 (0.81) achieved on a 1 to 5 scale. It triangulates well with the observation that the production lines were very lean and buffers were being continuously reduced or eliminated, in many cases in a quite dramatic fashion.

The mean difference is significant between SERASA and all other cases except CIGNA (2-Tail sig. = 0.305). However, there is no significant statistical difference between the mean scores of CIGNA, TNT, and Toshiba (Fprob. = 0.2365). The four means are not significantly equal but they can be considered so in practical terms. The relative difference between the means is generally below 10 percent of their value (see graphic below).

The average score for change is 3.05 (SD = 1.18) revealing that a very significant evolution has been perceived by members. It was expected that CIGNA and SERASA

---

\(^{27}\)Buffers can be physical or not. Excess time and resources work as buffers and expand the common notion of buffers as physical WIP between tasks.
would score higher because they had undergone reengineering programmes which had redesigned many of their business processes. Nevertheless this was confirmed only in the case of SERASA (mean = 3.59 SD = 1.01) while CIGNA (mean = 2.53, SD = 1.12) scored below TNT (mean = 3.24 and SD = 1.11).

This can be explained by the fact that although CIGNA dismantled large sections of the organisation in favour of cell production, it was done at a gradual pace while TNT eliminated three day sorting practically overnight. Toshiba's low scoring is consistent with its continuous path of improvement without major dramatic changes.

![Figure 7.2 - Intensity of dependency]

### 7.4. Cross cases differences

Association between intensity of change in managerial process and bottom process - A strong pattern associating changes at one level with changes at another emerged in this study. This gives a strong indication that changes at the lower levels of the organisation are dependent on changes at higher hierarchical levels. More specifically, the evolution of organisational processes at the bottom is dependent on the evolution of managerial processes. This could be observed as the organisations differed in the intensity of change which occurred in their managerial as well as their organisational processes.
Indeed the importance of what managers actually do and how it affects lower hierarchical levels cannot be overstated. For instance, sponsorship by top management of continuous business process improvements inspired by TQM principles, would not have succeeded if the gap-closing process had kept on excluding the participation of middle managers. The same would be true if middle managers had maintained a tayloristic style and had not regarded workers as active agents of transformation.

Among the four cases, SERASA is the one whose management processes were most dramatically altered. CIGNA and TNT come second because change was very significant but not as dramatic as in SERASA; and finally Toshiba, a case better understood as a process of evolution.

SERASA had all of its management team removed at once. The new CEO managed to change managerial processes radically. Consequently, all the categories of organisational behaviour were reported to have undergone extensive change which rendered them very different from previous behaviours. At the other extreme, Toshiba’s managers were already adapted to the Toshiba “way of doing”. The new manager was responsible for gradual modifications in managerial behaviours. The extent of the transformation can hardly be compared to SERASA’s case.

TNT and CIGNA represent an intermediary category. In these companies managerial change was not as dramatic as in SERASA, but certainly cannot be considered evolutionary as in the case of Toshiba. The change process in CIGNA explicitly tackled the nature of the management processes, but unlike SERASA, senior managers were not dismissed. TNT also retained its basic management structure and promoted gradual changes in its managerial processes.

The chart above shows the differences in member’s perceptions of changes which occurred in the behaviour categories which represent the organisational processes. The means for CIGNA and TNT were found statistically to be the same (2-tail significance of
while SERASA and Toshiba occupy respectively the top and bottom corners of the chart and do not overlap.

![Figure 7.3 - Intensity of organisational processes change](image)

**Difference in scoring between companies in terms of intensity of organisational behaviour** - The four companies considered in this study differed in the intensity of organisational behaviour ($F_{\text{prob}}=0.0000$). CIGNA achieved the highest overall scoring (considering all categories of behaviour at the same time), followed by TNT and SERASA which were not found to be significantly different (2-Tail sig. = 0.244), and finally by Toshiba.

The division of scoring into three clusters suggests the influence of business processes on the intensity of organisational behaviour. CIGNA may show more intense behaviour because the same team performs all the production steps. However, because there is no need to co-ordinate with people from other functions, the only category of behaviour in which CIGNA does not have the highest scoring is co-ordination.

TNT and SERASA occupy the intermediate cluster. A network of branches and central headquarters performs their production steps. The similarity of the organisation of the production processes may have contributed to placing them in the same cluster.
The fact that Toshiba the least intense organisational processes of all four companies, suggests the hypothesis that those beneficial behaviours could be more easily achieved in services than in manufacturing. Manufacturing operations, such as this case, present a great deal more complexities than the service operations considered here. This may have negatively affected co-ordination, entrepreneurship, and learning.

7.5. Open issues from the literature review

7.5.1. Does a company necessarily need to implement a manufacturing (operations) strategy to have competitive advantage?

The MSM cannot account for the strategic processes that we have observed. The model is mechanist, it relies excessively on managerial rationality, and it misses essential issues that compound our explanation of strategic processes. Besides, the decision areas proposed in the MSM literature were difficult or impossible to recognise in service firms. However, two of the model's central elements stand firmly: (a) The definition of gap-closing objectives which acknowledge the need for trade-off among performance criteria and (b) the content of strategy concentrated on structural decisions.

Some examples of the importance of gap-closing objectives are found in all cases. CIGNA defined carefully the expected standards of performance and the perception of the company's performance. TNT prioritised the development of dependability by focusing on on-time performance perceived by the customers as the most important attribute of service. Toshiba prioritised one dimension of performance at a time. SERASA focused on the quality and speed of its processes.

Structural decisions largely concern the reorganisation of production processes and the redesign of the organisational structure. Both were evident in CIGNA who regarded the re-organisation of its production processes from large departments into cells as the most important single step to achieve its operational performance objectives. One of TNT's initial actions was to redesign its sales processes. SERASA's main design action concerned the redesign of the organisation. Although its strategic planning targeted
business processes, the use of reengineering was decided in an emergent way. Similarly, Toshiba's decision to substitute production lines with cell production came late in the process when the organisation had already closed quality and productivity gaps and was working towards achieving greater flexibility.

Although some elements of the MSM correspond to field observations, Hayes and Pisano (1995) have argued that the adoption of the MSM cannot result in differentiation, and consequently in competitive advantage, in the long term. All competitors, they say, should be able to follow the same manufacturing strategy. They conclude that as long as managers take similar decisions to align structure and infrastructure with competitive strategy and embark on improvement programmes, there should be no differentiation in operational performance in the long term. Similarly, companies that adopt lean production techniques may see all their competitors adopting similar techniques and eliminating advantage.

The strategic processes described here departed significantly from lean production and the manufacturing strategy models. Our model shows that top-down initiatives are considerably less important than acknowledged by lean production and manufacturing strategy models. Senior managers may have taken decisions that can be associated with elements of both models, but those decisions play only a small part in the complex process that creates operational differentiation.

The focus of strategy should be deviated from hard changes in production processes and managerial systems. The most important changes are invisible. They refer mainly to evolution of managerial and organisational processes. This is not addressed explicitly by any of the models. The development of managerial and organisational processes is emergent and intrinsic to each company and does not depend on resources available in perfect markets. Indeed the processes bore little resemblance to the MSM idea that companies implement their strategies mainly by acquiring elements from external markets and assembling these inside the organisation.
Unlike MSM and lean production, the model presented here meets Peteraf’s (1993) three basic conditions that characterise competitive advantage: (a) the transformations observed cannot be bought in the available factor markets, (b) there are difficulties in replication by other companies and (c) the advantage is heterogeneously distributed among competitors. We have not tested the last condition because companies with poor performance were not included in our sample. Nevertheless, it is safe to assume that an average competitor’s performance would be at the level of those companies before the process of change.

The strategic processes that we have studied are too complex to be described by the MSM. In these processes the role of top management is less one of defining actions than one of shaping the emergent processes. As senior managers shape the strategic process, they create conditions for organisational processes to develop. Very active, “invisible”, organisational processes are responsible for the effectiveness of the production process and consequently the levels of performance.

We conclude that firms do not need to implement an MS to have a competitive advantage, because the model misses the essential elements which explain how advantage based on operational effectiveness can be created and sustained. This does not mean to say that the MSM is inappropriate. Some elements of the model stand, proving that managerial intention is necessary. Although the notion of “grand design” strategy, in which all steps are defined from the outset, does not correspond to reality, strategic intent must exist.

We found managerial intention and the outcome of competitive advantage to be connected. However, we see the nature of the connection between intentionality and outcome to be essentially different from that proposed by Vickery (1991). He suggests that competitive advantage results from a better ability to implement a strategy the content of which should be the same for all competitors. In contrast, intentionally, our view gives direction to the strategic processes which have a strong emergent component.
7.5.2. Which theory can best describe the evolution of operational performance: Resource-based theory or the manufacturing strategy framework?

The theories considered here are not fully competing theories. They do not use the same constructs and they do not address the same set of issues. Nevertheless, they are theories concerned with the productive resources of the firm. In contrast to the MSM, the RBV is rather vague on how productive resources should be managed, but provides the foundations within which we can define the characteristics that must underpin any model of competitive advantage.

As we have already discussed, the theories advocate opposite views of the strategic process. The RBV stands for a bottom-up strategy based on non-transferable productive resources that are particular to the firm and the MSM sees a top-down process in which the outcome is determined by managerial rationality. Our view of the strategic process, which leads to differentiation of performance, does not entirely subscribe to any of the views. In the figure below we show where our model stands in relation to the issues highlighted in item 2.16.2. Using the assumptions of each model as extremes in a continuum, we can see that although tending towards the RBV, no model in isolation can be used to describe the process.

The observations support the RBV view of advantage depending on “invisible assets”, instead of structural elements which is the MSM view. Nevertheless, these assets have a rather different nature from those that have been described in the literature. Nanda (1994) sees the “invisible assets” that account for competitive advantage to be a by-product of production processes and to have accumulated through organisational learning. According to this view, learning-by-doing generates firm specific learning. Learning is captured as technical expertise or is embedded in the behaviour of its members. According to this account, the role of management is negligible.
<table>
<thead>
<tr>
<th>manufacturing strategy</th>
<th>resource-based theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptive advice emphasising structural factors</td>
<td>Advantage based on infrastructure “invisible assets”</td>
</tr>
<tr>
<td>Capability building Process determined by strategy</td>
<td>Capability building Process led by learning-by-doing</td>
</tr>
<tr>
<td>Capabilities developed in function of agreed objectives. Focus on content</td>
<td>Capabilities development as an emergent process. Focus on process</td>
</tr>
<tr>
<td>Top down strategy implementation</td>
<td>Adaptive strategy processes</td>
</tr>
<tr>
<td>Short run optimisation of resources</td>
<td>Long run processes development of resources</td>
</tr>
<tr>
<td>Undifferentiated strategic outcome</td>
<td>Differentiated strategic outcome</td>
</tr>
<tr>
<td>Unlimited managerial cognition</td>
<td>Limited managerial cognition and action</td>
</tr>
<tr>
<td>Replication not considered</td>
<td>Replication is a central issue</td>
</tr>
<tr>
<td>Initial conditions are not important</td>
<td>Initial conditions are important</td>
</tr>
</tbody>
</table>

Figure 7.4 - Positioning of our model in relation to the MSM and RBV.

Therefore the theories are at odds with what constitutes the basis of advantage and the management role in creating it, because the MSM sees senior management as only responsible for the development of the firm’s abilities. As we rule out MSM’s direct connection between senior management intentions and advantage, we also discard RBV’s concept of invisible assets as a by-product of learning-by-doing.

We propose that the strategic dimensions of the invisible assets are the organisational processes. They are: co-ordination, entrepreneurship, and learning. Organisational processes are developed, not by top-down implementation of strategic intent, but by the adaptive evolution of managerial processes, and by the action of redesign and control activities. In opposition to the RBV which sees no correspondence with the development
of invisible assets, we see a relationship although not as direct as the one described by the MSM.

The issue of the nature of the strategic process deserves a middle ground. At the same time as it acknowledges a role in gap-closing activities and the definition of the content of strategy, as the MSM suggests, it sees also the strategic process as essentially emergent and adaptive. This is in accordance with the RBV, which suggests that the development of "invisible assets" has to be regarded in a processual way. The resulting model sees a role for the "rational manager", yet one which is a long way from the total rationality implicit in the MSM. Senior managers are seen to compensate for their limited rationality by focusing attention on specific issues and thus shaping the strategic process instead of concentrating all the decisions on themselves.

An essential notion derived from the RBV is that organisations have inertia to change. Inertia results from the fact that the firm's original conditions interfere with the strategic process, limiting the outcome and the speed of change. MSM's assumptions of neo-classical economics roots misleadingly imply that change can be readily achieved and the organisation can redirect its path of improvement as much as it wants. The initial conditions of the firm affect the strategic process. The main difference between Toshiba and the other cases was that Toshiba's initial conditions were more compatible with its operational goals. Consequently, it could focus attention directly on operational issues, or on first order initial conditions. In contrast, the other cases concentrated their struggle on the change of second order initial conditions.

The firm needs time to change its initial conditions, especially its managerial and organisational processes. The changes in these processes are not achieved through particular decisions. Instead, the alterations in organisational processes result from a gradual and ambiguous change process. The organisation needs a considerable amount of time to consolidate changes of its managerial processes that will make possible the gradual evolution of organisational processes. The total change process is likely to take
years, as we have observed, although considerable performance improvements can be achieved in the early stages.

Sanchez and Thomas (1995) distinguish between capability building and capability leveraging. The former represents qualitative change in the (invisible) asset base of the organisation, while the later is best described as a quantitative development of the same resource base existing in the organisation, or the acquisition of resources from external markets. We suggest that there is qualitative change when the initial conditions are significantly altered. Because the MSM does not see a role for the systemic transformation of initial conditions, we consider that it can prescribe a capability leveraging process, never a capability building one. Only a capability building process can lead to differentiated outcomes.

7.5.3. How does the model affect our view of the strategic importance of operations?

Hayes and Pisano (1995) consider some changes in the way we regard operations strategy due to the change of paradigm of competitive advantage. Because the strategic question is now “how to compete”, in place of the previous “where to compete”, manufacturing strategy can produce answers to the strategic debate. We should be able to define prescriptive answers to the question how to compete. We use the MSM and Porter (1996) to highlight the issues on which prescription advice is based. We then discuss what we mean by operations strategy and how it fits into the dynamic capabilities framework.

The MSM sees strategy as a matter of strategic fit. Operations should make a conscious effort to align what they can do with market demands. This implies, in the short term optimisation of the structural resources of the organisation by means of trade-offs aimed at achieving attributes of performance prioritised in terms of market importance\(^\text{28}\). The goal is to improve operational effectiveness.

\(^{28}\) Slack adds the consideration of the relative performance of competitors.
Porter (1996) sees it differently. He makes a clear-cut distinction between the search for operational efficiency and strategy. Strategy is about finding different ways to perform similar activities or structuring production systems differently. Companies with strategy are those that assume choices in terms of trade-offs and limit what they offer. The firm should be able to create an ideal and sustainable competitive position by choosing to perform different sets of activities and interlock them in a series of strategic fits that will make replication difficult or impossible.

Porter (ibid.) argues that whatever advantage the firm achieves by focusing on operational efficiency improvement is likely to be quickly eroded because best practices diffuse fast. As we have argued, strategy is seen here as the search for operational effectiveness, through a process that has little in common with the adoption of best practices described by Porter. The achievement of outstanding operational efficiency for the companies in our case studies means systemic and complex organisation-wide evolution.

In spite of the disagreement over the issue of what strategy is about, Porter (1996) highlights two of the most important elements of the strategic process. Strategy, he says, is about keeping the same course of action towards a specific goal by means of limiting what the organisation delivers. Thus we suggest that an organisation has a strategy when management acts consciously to limit what the organisation can offer and keeps the momentum of the change process focused on specific ends.

Resistance by managers or employees did not precipitate U turns in the strategy.

Throughout the strategic processes managers did not abandon courses of action or turn

---

29 Operation effectiveness meaning "performing similar activities better than rivals perform them. Operational effectiveness includes but is not limited to efficiency. It refers to any number of practices that allow the company to better utilise its inputs by, for example, reducing defects in products or developing better products faster".

30 According to Porter (1996) there are three levels of fit. The first one, also central the MSM, is the fit among the activities of each function. The second fit occurs when the firm's activities are not only consistent but also reinforcing. The third and more complex fit refers to co-ordination and information exchange across activities that allow the company to optimise its effort. In the example, Porter describes
their attention to other priorities before consolidating achievements in performance. For instance, CIGNA avoided expanding until the strategic process was consolidated. Many years after initiating the strategic process, it began cautious expansion into new markets.

The central notion of the MSM remains important. Firms will not be able to achieve high performance in all attributes of performance simultaneously and should limit what they want to achieve. We have observed managers focusing the attention of members of the organisation on a limited number of issues. In Toshiba the issues were different according to the attributes of performance being pursued. Initially the organisation focused on issues connected with the quality of the product. Then it moved to issue of productivity. Other issues were gradually introduced and were considerably different. Everyone was engaged in eliminating inefficiencies in the production processes, such as bottlenecks. Until then it had not been a concern. In the same manner, when the focus was on flexibility, completely new issues were introduced.

As a lean producer Toshiba’s final goal was to achieve high performance in all attributes of performance. It may seem that there was no room for choice. The longitudinal perspective uncovered a process where managers were continuously choosing and limiting what they demanded from its production function, while maintaining a strategic course of improvement.

So far, we have concluded that answers to “how to compete” relate to a search for operational efficiency characterised by keeping the organisation moving towards achieving specific goals while exercising choice by limiting what it can offer. Departing from these assumptions, our notion of operations strategy builds on the strategic advice of the dynamic capability perspective. Teece and Pisano (1994) place the strategic focus of analysis on the previous history of the organisation and on firms’ processes. Managerial choice, or strategy, is about identifying and supporting difficult to imitate paths and processes that will be the basis for valuable products and services.

---

the optimisation of turn over of stock in Gap to be possible by its sticking to low variety of models, which makes it easier to implement very short model cycles.
The first concern of strategy is to recognise the importance of history because it limits the choices available. It is possible that the path of improvement followed by the organisation will limit its future options. Leonard-Barton provided us with examples of companies that were trapped in the expertise they developed and had lost sight of what was happening elsewhere. Instead of considering technological expertise as rigidities, we have observed that the path of improvement followed by the organisation influences the nature of the process drivers. It may also result in a number of complementary assets placed up (distribution channels) and down (suppliers) the production chain, which can create rigidities.

Toshiba is again the case in point. Teece, Pisano and Schuen (1997) have argued that the path of development will determine what the organisation learns. This is intimately linked to its method of process control. Process control was initially based on the six-sigma paradigm during the quality and productivity phases. When the focus switched to flexibility the six-sigma paradigm was found to be inadequate. The organisation realised the need to control variables that were not only local but that could account for the process as a whole.

The managerial processes are also affected by the course of improvement. Performance control process, for instance, would certainly have different foci according to the goal of improvement. Henderson and Clark (1990) argue that the choice of the path of improvement creates contingencies that shape not only learning but also communication channels, problem solving approaches, and interactions across functions borders.

The prescriptive implication of the importance of the paths of improvement influencing the shape of the process drivers is to be found in the sand cone theory (Ferdows and De Meyer, 1990). The organisation may have to pursue goals that induce a coherent development of the drivers. Each stage has to build on the basis provided by the previous one. For instance, by seeking to achieve high quality, organisations develop six-sigma process control for eliminating local sources of variation. When the organisation is
seeking flexibility it can concentrate on organisation's wide sources of variation because the local ones are already under control. Similarly, it is possible that as the organisation moves through the sequence of development, the managerial processes will become increasingly more sophisticated.

The second concern of strategy is to identify the processes responsible for producing valuable products and services. We propose that valuable managerial processes are those that support the model of issues and answers proposed by senior managers by defining coherent and purposeful attentional structures and decision channels. As this perspective is in its infancy, it is difficult to assess the importance of each managerial process.

The importance of individual organisational processes is more evident. For instance, we can argue that in some cases co-ordination may be more important than learning. This is the case with processes that have limited room for improvement, rarely incorporate new knowledge, and/or are not easily disrupted by variations in inputs. One example is the process of turning a plane around in the gate. Hardly any learning will occur because employees rarely need to absorb new practices or be aware of new issues. In addition, the process is flexible enough to handle contingencies without being disrupted, which downplays the need to control sources of variation. Nevertheless, co-ordination is of fundamental importance to accomplish the task under time pressure (Gittel, 1996).

Complex manufacturing operations are different. They are very sensitive to disruption caused by any variation in the system. Process control exists to identify and eliminate, where possible, the sources of variation. It is likely that new knowledge about product and process will need to be diffused. In addition, the continuous change of practices is central to continuous improvement. On the other hand, co-ordination has a more limited role. The ability to communicate and help each other is important in a factory but not as important as for example in the case mentioned above where individuals have less dedicated roles than in manufacturing plants.
We have not presented a radically new view of operations strategy. The model presented here grounds some of the basic elements of the MSM, such as the need for deliberate action and the concept of trade-off, into the new competitive framework. By developing a model based on the drivers of performance improvement, we have attempted to change the unit of analysis and the analytical focus of operations strategy. The proposed model gives strategic importance only to infrastructure while recognising structural issues as important elements in the strategic processes. It breaks with the decision areas paradigm and addresses infrastructural issues in terms of processes\textsuperscript{31}. The process view gives a new perspective for understanding the infrastructural side of the organisation.

Perhaps one essential virtue of the model presented here, is to transform the perception of strategic contribution at lower hierarchical levels and link it to what managers do. This contributes to removing much of the ambiguity and the lack of objectivity that have characterised discussions on this issue. It gives shape and demonstrates the strategic importance of firm-specific bottom processes: learning, co-ordination, and entrepreneurship.

The new model makes operations strategy compatible with the emerging paradigm of competitive advantage. It also places the analytical focus on the inter-personal processes of the organisation, and incorporates other aspects of the literature, such as the learning organisation and business processes reengineering, which although related, were never discussed within the same model. Normative implications for the model are discussed further in the next chapter.

7.5.4. Are distinctive advantages emergent or intentional?

According to the model presented here there is an intimate link between intention and outcome. This results in an apparent paradox. If intention drives the outcome, then the means to achieve that outcome can be articulated. Once articulated, competitors can also implement the same recipe. According to Barney (1986), if a firm can articulate the

\textsuperscript{31} Indeed, the literature has never succeeded in linking the strategic process to decision into infrastructural
mechanisms of its advantage, this knowledge will eventually spread to competitors. The acquisition or development of the resources that leads to performance will eliminate that relative advantage.

The "core competencies" concept has become a buzzword and disseminated the idea that companies with an advantage have distinctive resources, often regarded as technological expertise. It reinforces the paradox by substantiating the RBV's notion that strategy is about the identification of imperfectly transferable resources. However, the notion of resources as the only differential explaining heterogeneous operational performance is not one that found correspondence in our field observations.

The paradox is only apparent. Although managerial intention leads to performance outcome, managers are unable to establish cause-and-effect relationships between resources and outcomes. Instead, the role of management is to manage the emergent strategic processes to achieve the objectives set by the strategic intent.

A number of authors have concluded that RBV's ideas will not find direct correspondence in the real world, and looked for alternative ways. Pisano (1994), for instance, has associated the development of "proficient" manufacturing with learning. Similarly, Nanda (1994) has moved away from discussions about managerial participation in the creation of advantage within the company's operations.

The view that the development of outstanding performance is somehow independent from managerial action is, implicitly or explicitly, grounded on the concept of the learning curve. However, the learning curve cannot explain lasting performance differences. Differences of scale can create temporary advantage, but as soon as competitors accumulate production to the point when the organisation reaps most of the benefits, the difference in scale can only reap marginal benefits.

---

32 Resources seen as inputs for production that can be well defined, such as organisational culture.
The literature creates an artificial dichotomy between manual dexterity and managerial intention because it is unable to (a) picture the contribution of shop floor workers towards performance much beyond manual dexterity, and (b) understand the link between managerial intention and action, and what happens on the shop floor.

The strategic process, as we have described it, is not exclusively emergent or intentional. The dichotomy is avoided only when we are able to establish the link between what management does and the evolution of first order initial conditions. The strategic intent leads the way but direct managerial deliberation cannot account for the process of strategic performance improvement.

7.5.5. What are the drivers of performance evolution?

The strategic process may be characterised by a succession of performance leaps and periods of continuous improvement. Performance leaps imply planning. Manufacturing strategy explains precisely this aspect. In contrast, lean production is closer to continuous improvement and stresses the active role of lower hierarchical levels in improving the firm's abilities. However, none of these theories can propose adequate descriptive variables of the strategic process.

Our proposed model contains what we believe can describe the strategic process in function of the states of its variables. Consequently, our field study was organised to describe the states and the elements of the proposed model. The within case analysis has demonstrated the relevance of each of the variables.

Gap closing is the managerial process associated with the search for performance objectives. This is the only driver of performance evolution considered by the MSM. We consider it an essential managerial process. It captures the intentional element of the strategic process. Nonetheless, apart from the MSM, we have observed managers being concerned with infrastructural issues instead of allocating existing resources to reshape structural elements. The role of the gap-closing process is better described by Sanchez
and Heene (1995) as working to motivate and to give direction to capability building and capability leveraging, instead of determining top down action plans.

The other managerial processes that shape decision channels in the organisation are: management style, senior management teamwork, and performance control. Together with the gap-closing process, they determine how the members in the organisation interact. The managerial processes are complemented by behaviour alignment that shapes the attentional structures. The managerial processes as a whole guide the strategic process by focusing the attention of the firm on the issues and answers model proposed by management.

Process redesign and control is a driver independent from managerial processes. It reflects how the organisation manages its business processes. Together, these six drivers work against the inertia of initial conditions. Only when initial conditions evolve can the organisational processes, which are the last drivers of evolution, come into play.

The organisational processes represent the component that sustains strong operational performance. It gives meaning to Hayes and Wheelwright's (1985) assertion that a firm that aims at strong operational performance should expect “the bulk of its improvements to bubble up from lower levels in the organisation”. Active organisational processes can give the organisation an edge because they, and only they, can eliminate “organic slack”.

The dimensions of the organisational processes are: co-ordination, entrepreneurship, and learning.

In this chapter we have developed the core ideas of this thesis. We have:

- Discussed the nature of management influence on the evolution of the firm's initial conditions. Three levels of influence between intentionality and outcome have been proposed. The results are articulated in terms of, and supported by, a model developed in Ocasio (1997)
• Articulated the similarities among the various cases. Because within case analysis is organised according to the elements of the model, most of the conclusions relate to the issues highlighted by the model. However, statistical treatment of the quantitative data helped uncovering relationships not related to the model

• Addressed the literature gaps in the light of research findings

From here we move to close this research. The final chapter is dedicated to the consolidation of the proposed model.
Chapter 8 - Conclusion

This last chapter concludes data treatment that was initiated in the previous one. Conclusions which emerged in the previous chapter are formalised and the model is consolidated. We begin the chapter by discussing the final version of the model. The elements of this model are strengthened through the test of the research hypotheses. We then summarise the general research findings and discuss how they affect the literature. The last topic concentrates on a discussion of the model and its consequences. The ideas in this last item represent the core findings of this research and have important implications for future approaches to strategy in operations. Finally, we evaluate the opportunities for further research opened up by this thesis and, with the benefit of hindsight, critically assess the methodology employed.
8.1. The model of operational performance improvement

The field research largely supports the model which we have proposed during the grounded phase of research and presented in 3.2. There is, however, an important point of departure from the original model. The results suggest that the bottom up influence, represented by organisational processes, on the development of the strategic process is more limited than we initially thought.

During the research, it became clear that the transformations necessary to sustain vigorous improvement in performance need to transcend the shop floor. This was not clear during the initial phases of the research. So we concluded that there was a possibility that the strategic process was essentially emergent, and the organisational processes were its central driver. The role of management would therefore be limited to leveraging the sources of advantage that would ‘spontaneously’ emerge from operations; But the final picture is a rather different one.

The model shows that the evolution of performance depends on the evolution of initial conditions that hinder the strategic process. Organisational processes cannot lead the transformation of the firm because its development depends on the two other drivers. Even when developed it cannot affect second order initial conditions. Although organisational processes cannot by themselves create the conditions for the evolution of initial conditions, they are strategically important. The effectiveness of the production (business) processes depends on the level of activity of the organisational processes.

The transformation does not emerge from the shop floor. However, middle managers play an important role. With the exception of a few “hard” decisions, such as those related to the organisational structure redesign, there was no line dividing thinking by senior managers and acting by middle managers. Outcome was mainly a product of countless micro-decisions which happened at the bottom of the organisation and were supported by compatible managerial processes at the top.
The model presented here demonstrates the link between managerial and shop floor behaviour. By developing appropriate and consistent managerial processes, managers create conditions for the development of active organisational processes. The managerial processes set the direction for improvement, the model of issues and answers, and define attention structures and decision channels. Thus, senior management moulds an intentional shape to a strategic process where evolution occurs gradually and is essentially emergent.

8.2. Analysis of the research hypotheses

The elements provided by the four case studies are used to support or refute the exploratory hypotheses proposed in the chapter that describes the grounded research.

8.2.1. Hypothesis 1: Strategic operational performance improvement requires the evolution of all initial conditions that hinder the evolutionary process

The initial conditions considered here reflect elements to which there are no factor markets outside the organisation. Structural elements, such as technologies, are purchased from the external markets that are available to all competitors and thus cannot hinder the evolution of operational performance. The initial conditions categories identified in the grounded research chapter were divided into first and second order, respectively: business processes, knowledge, behavioural processes; and structure, market, managerial systems, and managerial processes. Below we follow the sequence above to discuss and summarise the description of the evolution of each process performed by the analysis chapters.

Business processes evolved significantly in all four cases. SERASA and CIGNA experienced redesign of existing processes and the move to cell production. In CIGNA, the reengineering of processes was the essential element of organisational transformation, while in SERASA reengineering occurred in an emergent way. With the appointment of the new board, the attention of the managers was directed to the inadequacy of the
business processes. Processes were mapped, and stages that were not adding value were eliminated. Later, working cells were implemented. These changed the existing processes significantly.

In TNT, especially at the PDC, processes were changed because sorting, which had previously been done in three days, would now have to be done overnight. Later with a change of management, there was a formal initiative to redesign manual processes. The processes in Toshiba had evolved continuous improvement. Now the assembly processes are going to be redesigned through the introduction of production cells.

Knowledge of the production process was a not significantly important initial condition except in Toshiba’s case. The evolution of quality in Toshiba depended heavily on shaping the working routines on the shop floor and training and supervising members until they could consistently achieve adequate standards. The productivity phase involved efforts by employees and engineers to eliminate bottlenecks.

The flexibility phase, however, highlighted the problems created by the elimination of buffers associated with long production runs. The parts shop was initially blamed for the disruption, but soon there was a realisation of the need to investigate the causes of disruptions. As the articulation of cause and effect was considered too complex, the organisation opted to highlight the production stage responsible for the each stoppage of the production line. This resulted in great reduction of the stoppage time in the span of just a few months.

The change in the behavioural process was significant. The high performance of these processes was the product of considerable evolution from the initial state. In Toshiba, the case closer to pure continuous improvement, the members found that change was significant but moderate (mean = 2.15, SD = 1.08). At one extreme, members of SERASA found change to be very salient (mean = 3.17; SD = 0.99). This is reflected in the huge changes that the organisation has experienced in its organisational processes and
structure. Similarly, CIGNA (mean = 2.60; SD = 1.18) and TNT (mean = 2.67; SD = 1.12) have experienced considerable change in their behavioural processes.

The structure in both SERASA and CIGNA went through great changes. SERASA eliminated several hierarchical levels and redefined roles closer to business processes. It also created parallel functions responsible for incorporating new trends from outside the company borders, as well as supporting the continuous improvement effort. The department parallel to operations is responsible for keeping updated the methodology used to evaluate credit risk and to test suggestions before implementation.

CIGNA developed a matrix structure where the production cells report both to the operations manager and to the manager responsible for the product. TNT management made little change in the organisational chart apart from the creation of the role of regional co-ordinators. These regional co-ordinators facilitated communication and co-ordination between headquarters and the depots. Some important players were removed to make way for changes in managerial processes in the PDC.

Some positioning was also revised. Toshiba gradually entered new market segments which were served by models produced in Japan. SERASA expanded into the market represented by non-financial companies which have a need for credit risk information or management. The jump from a captive market represented by the shareholder banks, to a market defined as “SERASA information behind every business”, demanded the development of customer orientation which had not previously existed. SERASA did not have a marketing department until 1989. At early stages of the turnaround process CIGNA dropped the life pension business in order to concentrate exclusively on health care products for corporate clients.

TNT is the case where the initial market orientation represented an initial condition especially difficult to overcome. When it decided to replace the three day market with overnight delivery, it faced internal resistance forcing senior management to take a considerable risk in supporting the strategy. If the new market strategy had failed to show
an increase in profits, the management team and particularly the marketing manager who had championed the initiative, would probably have had to resign.

The transformation of managerial processes and systems is intrinsically linked. The transformation of the managerial processes which defined the way in which members interact (gap closing, management behaviour, senior management teamwork, performance control) is directly linked to managerial systems such as those that determine performance evaluation and strategic planning. The managerial processes that define attention structure are directly linked to systems of human resources management, especially those related to performance reward.

The managerial processes that define gap-closing objectives were considerably modified. SERASA changed the gap closing routines by implementing a new strategic planning system. CIGNA evolved from a situation in which workers had no say to the point that the teams set their own targets under the supervision of the operations manager. TNT began to set targets for indicators of service and costs, and left it to the depot manager to make them work. In Toshiba, senior managers defined overall targets for the plant and set goals for each area.

Senior management teamwork was improved in all four cases. SERASA's CEO appointed new senior managers departing from the essential idea that they should have as broad a vision as possible of the business, instead of concentrating their attention on only one function. The new planning system contributed to the achievement of teamwork at senior level because plans normally emerged from lateral multi-functional interaction at the bottom of the organisation. Senior managers are also encouraged to take courses in credit management to be aware of the essence of the business.

To achieve teamwork among CIGNA's senior managers to support the change process was a goal of the change team and a main concern of the CEO. The new matrix structure also collaborated to create a teamwork environment, once managers had shared responsibilities. New managers who were able to work in the new environment, gradually
replaced the old management team. Collaboration between TNT's functional areas did not previously exist. Now operations and sales managers control the traffic in the network on a daily basis. In Toshiba, the ability of senior management to work together was gradually increased as English managers developed a number of management skills, which the Japanese members considered essential, and proved themselves up to the task.

With the exception of Toshiba, where change was gradual, the management style was radically transformed in all cases. Senior and middle management adapted their style to the new set of issues and answers and allowed greater empowerment of the hierarchical levels below them. The substitution of large departments with cell production in SERASA and CIGNA was important to revolutionise the relationship between the workforce and line management. Line managers were changed from supervisors to coaches.

All the cases implemented mechanisms of performance control. SERASA developed an extensive collection which amounted to more than a thousand indicators from which 15 were checked daily by senior management. CIGNA’s operations manager now discusses the indicators of performance at a weekly meeting with team leaders. TNT has developed a sophisticated range of performance indicators which tracks the performance of each depot in terms of costs and service quality. Toshiba also measures shop floor performance indicators that are used to track whether improvement is happening or not.

The transformation of attention structures received special attention from management. Top managers presented the firms with consistent models of issues and answers that should guide behaviour. SERASA and TNT based their model on the quality model, while CIGNA and Toshiba based theirs on successful formulae from their parent companies. The companies made extensive use of reward systems. Leadership was the glue which united all the elements in the process of aligning the behaviour of the organisational members. In all organisations this process evolved and became more sophisticated in the strategic process.
Conclusion: The hypothesis is partially supported.

The hypothesis is only partly supported because not all initial conditions were considered important in all cases. Knowledge was found to be an issue only in Toshiba. We can speculate on a number of explanations. One hypothesis could be that the service's business processes are less subject to disruption due to variations of inputs of process. Therefore, service companies do not need to develop the knowledge about which are the variables that affect the outcome of the process, and how to control them. The other two categories of first order initial conditions, business processes and organisational processes, could be observed to have evolved in all cases. But the evolution of second order initial conditions is not so evident. Structure, for instance, that developed so dramatically in SERASA and CIGNA, was only adjusted in TNT, and hardly suffered any change in Toshiba. Toshiba was organised from the beginning as a lean organisation and TNT structure was reasonably flat. It could not be said, however, that in these cases structure was not hindering the improvement of operational performance.

Market positioning was not seen as an issue to Toshiba but was very important to SERASA, TNT, and CIGNA. For CIGNA it meant the concentration on only one type of business. For SERASA, it allowed the expansion of the organisation output. TNT's new market strategy unexpectedly created conditions for elimination of structural slacks. In these three cases the new target market represented a successful strategy that allowed the organisations revenue and/or profits to be significantly increased. As a cause and effect relationship between increased profits and change was established, it gave an indisputable legitimacy to the change process and the senior managers responsible for it. It also offered other hierarchical levels a perspective of gains in the form of higher income or even simple opportunity of keeping their jobs, which had previously been threatened.

Not all managerial systems were equally important to all firms. Toshiba hardly used monetary reward systems while other organisations made extensive use of theirs. However all organisations were careful to eliminate those managerial processes that were running contrary to the objectives of the organisation. TNT, for instance, changed its pay
system for shop floor workers. It had been paying operatives on an hourly basis when it wanted the work in the PDC to be finished quickly.

**8.2.2. Hypothesis 2:** The relevant drivers of strategic operational performance improvement are (a) the organisational processes co-ordination, entrepreneurship, and learning; (b) the managerial processes: gap-closing, management style, senior management teamwork, performance control, and behaviour alignment; and (c) activities related to process control and redesign.

When we defined the research methodology, we chose to describe the process as "a category of concepts linked to actions of individuals and organisations". We operationalised the categories proposed by the hypothesis as constructs and measured them as variables. These variables interact with the initial conditions\(^3\) to produce strategic outcomes. To be a relevant driver a variable has to describe the actions of individuals, at both managerial and staff level, which have any influence on the outcome of high operational performance. It should also consider the actions of the organisation, which cut across hierarchical levels and cannot be related to any particular individual.

The variables were initially proposed through grounded research. During the research we refined them and clarified their boundaries. In particular the variables related to organisational processes were refined by means of statistical treatment.

In chapter six we defined the state and variation of each variable. Because they all proved relevant, we can conclude that the managerial and organisational processes have succeeded in the actions of managers and staff which affect the desired strategic outcome. The implication is that strategic outcome is dependent on whether or not managers are doing things like engaging in gap closing processes, adopting a participative management style, etc. The same is true for organisational processes. A desirable outcome is dependent on whether or not staff behaves in a way which results into intense organisational processes. We have also shown that the way in which the organisation manages its business processes, through redesign and control, is also an important variable. The variables fulfil the goal of prediction suggested by this research. The power
and precision paradox explains that even if we have an incomplete understanding of the systems function, it is possible to make an accurate prediction.

Conclusion: The hypothesis is supported.

8.2.3. Hypothesis 3: The drivers of strategic operational improvement are mutually dependent and supportive

The chart shown in 7.4. indicates that companies that underwent greater change in their managerial processes also achieved a greater degree of change in their behavioural processes. However, before becoming compatible with the development of beneficial shop floor behaviour, management processes need to develop internal coherence.

We argue that it was necessary to achieve internal consistence among the managerial processes, which determine interaction between organisational members (gap-closing, senior management teamwork, management style, and performance control), and the managerial processes that determine attention structures (behaviour alignment). The consistency and compatibility of the managerial processes, supported by the management of business processes allowed the organisation to develop high performance organisational processes.

The processes that shaped the interaction of the decision-makers had to be compatible. Gap closing processes were responsible for involving decision-makers from all levels in the implementation, and sometimes in the formulation, of strategy (especially in the case of SERASA). To be effective, gap-closing processes needed to be compatible with other processes, such as the style of management. A style of management that did not respect the ideas and values of other managers and workers would go against participation of lower hierarchy levels in strategy.

33 Note that managerial and organisational processes are also initial conditions.
The same holds true for senior management teamwork. If senior managers engaged in political dispute over prestige and organisational resources, gap-closing processes would not be able to mobilise organisation-wide strengths to support eventual initiatives. Similarly, in a case where performance control failed to provide the appropriate debate and interaction between the hierarchical levels, the strategic processes would be jeopardised. Thus, we should expect internal consistency among the managerial processes that determine the interaction of members and the decision making processes.

Behaviour alignment is the managerial process that defines the attention structures. It creates and distributes decision channels, regulates the "valuation and legitimisation" of issues and answers through leadership, and redesigns structure and systems to shape the "interests and identities that guide decision makers' action and interpretation" (Ocasio, 1997). Therefore it should be compatible and supportive of the other managerial processes. Imagine that the gap closing process identified what should be the objective of the organisation, but it was contrary to members' interests and identities. The strategic process would probably be crippled by sabotage from individuals or groups who perceive the process to be a threat to them. In conclusion we can say that the managerial processes are very dependent on each other.

We have concluded over the need of managerial processes to be internally coherent and compatible with organisational processes. We should now examine the need for compatibility between these two drivers and the process redesign and control. The popular press normally attributes successful turnaround process to punctual intervention of management in business processes. CIGNA, for instance, was described as a case in which the only important drive of transformation was the redesign of its business processes. SERASA is also a case where reengineering has been attributed a central role in the transformational process.

Some strong evidence supports the idea that strategic performance improvement depends on systemic coherence. Leonard-Barton (1992) investigates in detail an outstanding performer, Chaparral Steel, which she sees as an example of the use of the factory as a
learning laboratory. She attempts to explain the means by which the company has built an unmatched operational advantage. This she attributes to its ability to learn faster than the competition. She concludes that this can be explained in terms of four dependent subsystems. Each subsystem is made up of three elements: (1) a learning activity that permeates the whole factory; (2) an underlying value, of which the learning activity is the operational expression; (3) a consistent managerial system whose procedures and incentives are supportive of the two initial elements. These subsystems are considered “tremendously” dependent on each other. She writes:

As the Chaparral example demonstrates, learning skills, management procedures, and values are interrelated. Values unsupported by management systems are vapid; management systems that run counter to values are likely to be sabotaged; learning activities unsupported by values and management practices will be short-lived. If a learning capability is to be developed, the whole system must eventually be addressed.

It has been shown here that the redesign and control of business processes are only another driver in a larger process of transformation. The redesign of processes without the change in managerial and organisational processes would afford no lasting significant improvement of the order achieved by the organisations in this study.

The evolution of managerial processes and the redesign of processes that eliminated unnecessary steps and brought production people closer, allowed organisational processes to flourish. It is difficult to see how entrepreneurship can develop when there are no high profile gap closing processes creating an environment of change, or where managers are authoritarian and do not respect workers as active agents of transformation.

Non-compatible managerial behaviour provides no incentive for learning, which can be made virtually impossible by obsolete business processes crippled by buffers where the

34 She also notes that other authors (Fiol and Lyles, 1985; Senge 1990) had already referred to the interrelated nature of organisational elements such as strategy, structure, and culture in determining how
The learning cycle cannot be closed. The same is also true for co-ordination which is highly dependent on managerial systems and practices (Gittel, 1996).

Conclusion: The hypothesis is fully supported.

8.2.4. Hypothesis 4: Very active organisational processes are a necessary condition to achieve strategic operational performance improvement

The companies studied evolved from a precarious competitive position, with the exception of Toshiba which started from scratch, and reached a position of acknowledged excellence in their industries. Hayes and Wheelwright (1994) say that companies that achieve stage 4, do so by opting for a continuous improvement path. Continuous improvement means active participation of the lower levels. Our view of the importance of shop floor operatives goes beyond their participation in continuous improvement activities. The strategic contribution of these organisational members is determined by the intensity of their organisational processes. Only if the firm manages to develop very active organisational processes can it develop its operational performance to a level that can affect its competitive position.

The scores achieved by the four companies are very significant in absolute terms. There are no similar research results with which we can compare them, with the exception of Gittel (1996). Nonetheless, it is difficult to dispute the fact that the processes are very active. The scores approach four in a scale that ranges from one to five. By assigning four in our scale, the respondent meant that that particular behaviour happened very frequently.

The histogram below shows normal distribution. It shows the proportion of the cases that corresponds to each case. It is coherent with the size of the companies. Cigna had around 200 employees in total, while TNT and SERASA had several thousand. The distribution of the population shows a similar pattern for all companies. The overall results, considering the three behaviours together are listed below:

effectively an organisation can learn.
### Companies Average Standard Number of
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERASA</td>
<td>3.60</td>
<td>0.87</td>
<td>974</td>
</tr>
<tr>
<td>CIGNA</td>
<td>3.94</td>
<td>0.85</td>
<td>254</td>
</tr>
<tr>
<td>TNT</td>
<td>3.65</td>
<td>0.86</td>
<td>622</td>
</tr>
<tr>
<td>Toshiba</td>
<td>2.98</td>
<td>0.85</td>
<td>983</td>
</tr>
</tbody>
</table>

Table 8.1 – Behaviour statistics

![Bar chart of behaviour intensity by company](image)

Figure 8.1 – Histogram of intensity of behaviour sorted by company.

Conclusion: The hypothesis is supported

The conclusion is not fully supported because we lack comparative data from average performers. Gittel (1996) obtained results in which a company with higher operational performance (Southwest) scored higher in co-ordination. In that case, a difference of one point proved to be very significant. However, we can compare the same companies ex-ante and ex-post the strategic process. A strong indication that these companies would score higher than their competitors, is the fact that processes were reported to have improved. At the beginning of the strategic process they were average performers and could be considered to be at the same level as the other competitors.

---

35 It refers to the number of valid entries, not respondents.
8.2.5. **Hypothesis 5**: Strategic operational performance improvement results in leaner organisations

An organisation is not lean when it has resource slacks built into its operations. Organisations use buffers to deal with speed and complexity (Galbraith, 1995). Airlines that are not lean have more employees and take longer to turnaround planes at the gates. Manufacturers that cannot react fast enough to customer demand, have stocks of finished goods. Intermediate WIP stocks compensate for the lack of knowledge of causal effects that disrupt production processes. Thus, companies use buffers to compensate for both lack of knowledge and poor organisational processes.

Resource slack can be structural or organic. Structural slack refers to poor organisation of the production steps. CIGNA’s large sections separated by WIP, TNT’s policy of slowing down the flow of parcels through the system, because they had to be delivered in three days instead of overnight, and SERASA’s highly inefficient processes are examples of structural slacks. Managerial actions that eliminate structural slacks include the creation of more efficient modes of production such as cell production, change of policy, and the redesign of inefficient processes.

The organisation should move to eliminate organic slacks after eliminating structural ones. Southwest is leaner than its competitors although their production processes are organised in similar ways. This occurred because Southwest was more successful in eliminating organic slacks. This made the difference to performance, not structural slacks.

When structural slacks are being eliminated, the company enjoys great leaps in improvement. TNT’s managers were astonished to find out they could sort all traffic overnight, offering a premium product while saving resources. Similarly SERASA and CIGNA multiplied output and increased quality dramatically, while using the same resources.
However, when maturity is achieved and most of the gross obstacles to efficient production are eliminated, the way towards leanness and competitiveness will depend on organisational processes. Gittel (1996) demonstrated that superior co-ordination processes allowed Southwest to have fewer buffers.

Learning has the same effect. The more successful the organisation is in completing the learning circle, the fewer resources it will need. When any member can contribute tested and unambiguous knowledge which can quickly permeate the organisation, the organisation becomes more efficient and members make fewer mistakes. Another important facet of knowledge is the articulation of knowledge.

Articulating the knowledge of a production system means understanding what causes what and controlling factors that might disrupt production and affect the end product. Toshiba learned that it should not produce two complex products in parallel. By creating and SOP36 in which complex products should never be produced in parallel, Toshiba avoided disruption and now has more production time. Entrepreneurship has the same effect as members show concern for tackling dilemmas and incorporating efficient new behaviours. This indicates commitment to go “an extra mile” when necessary and to pursue continuous transformation.

Conclusion: The hypothesis is fully supported.

Leanness can provide lasting advantage. But an organisation cannot be designed to be organically lean. The use of BPR and the implementation of best practices can at best eliminate structural slack. But advantage lies in the elimination of organisational slack. It can only be achieved by very active organisational processes. Because the development of organisational processes depends on the appropriateness of the managerial processes, we can conclude that advantage is dependent on complex organisation-wide relationships, which cannot be achieved by programmatic changes. We can now present a simplified path of the evolution of operational performance:
8.3 Summary of the main empirical findings that run counter or add to the established theory

8.3.1. The process that describes the development of outstanding operational performance is fundamentally different from the MSM

The service companies in our sample identified relevant competitive criteria, estimated the operational gaps, and focused their activities to close them. But they had not formally considered the trade-off of competitive criteria. In contrast, the manufacturing company

36 Standard Operating Procedure.
addressed trade-offs in a formal way. The top manager chose to follow the sequence quality (dependability), productivity, and flexibility.

According to the MSM, trade-off decisions, or more loosely, the limitations imposed onto the production function, guide the decisions on structural and infrastructural areas. Hayes and Wheelwright (1994) define the MSM as a "sequence of decisions [in terms of the decision areas] that, over time, enables a business unit to achieve a desired manufacturing structure, infrastructure, and set of specific capabilities".

There were decisions taken over structural and infrastructural areas. These were mostly emergent decisions, rarely taken during the planning phase of the strategic process. The emergent character is closer to Hayes and Wheelwright's view of the strategic process than to the exclusively top down approach advocated by Skinner. However, these decisions are a poor descriptor of the strategic processes we have observed. If decisions were the relevant descriptors of the process, the ambiguity element would be lost. Competitors would be able to replicate quickly the same decisions.

The lean production model, as described in the literature, consists of the adoption of a family of techniques. Like the MSM, it fails to realise that changes have to transcend the shop floor and affect all aspects of the organisation. Both models may be essentially misleading because they do not highlight the fact that the analytical focus of the strategic process should be what managers do every day. As a result, managers may believe that they can implement changes that will affect only shop floor routine while their own methods remain untouched.

The model presented here require managers to acknowledge that they have to modify their ways. Without giving up incompatible behaviour it is unlikely that the company can achieve an operational performance strong enough to influence its competitive position.
8.3.2. Operational advantage is neither the exclusive product of managerial rationality as implied by the MSM nor emerges without connection with managerial activity as suggested by the RBV.

The MSM tends to see the transformation that leads to an increase in operational performance as the result of managerial decisions, even when taken in an emergent way. On the other hand, the RBV regards proprietary superior abilities to have evolved based on learning detached from managerial activities, in a process generally associated with the learning curve effect.

We have shown that there is a connection between intention and outcome. By itself it contradicts the RBV. Intention is manifested in three degrees. Only the first, and more direct one accords with the MSM's view. The most important transformation occurs via indirect rationality. To guide the process in an indirect way, senior manager(s) set the foci of attentions and redefine the organisational context, thus influencing routine micro decisions.

Influenced by the RBV ideas, in the initial stages of the research we expected advantage to be unrelated to what management does, and to emerge mainly from organisational processes. The RBV suggests that productive resources may occur by chance or as an unexpected consequence of following a certain path of improvement. We found that organisational processes are essential to achieving advantage, but they evolve as a consequence of a process that is firmly rooted in managerial intention. Intention is nonetheless far less powerful than the MSM supposes. Its role is to shape an emergent and complex process.

8.3.3. Competitive advantage does not mean literal implementation of the content of strategy

Distinctive competencies refer to what the firm can do better than competitors. A number of authors see competencies as the result of a special ability to implement strategy. Competitive advantage, according to this view, will be achieved by firms that have better “preparedness, skill, or capability” to implement a certain product-market strategy.
Managerial rationality is unquestioned, and what managers decide is assumed to be problem free. The central problem then becomes the ability of the rest of the organisation to realize decisions. It immensely simplifies the explanation of the phenomenon of heterogeneity of performance by reducing it to the concept of "ability to implement".

This notion departs from what we have observed on at least two counts. First, it calls attention to the short run optimisation of the existing productive resources. In contrast, we have observed long term processes based on the gradual development of infrastructural elements. The strategic processes stretched over periods that were at least a year. A long-term vision is necessary so that initial conditions can evolve. Initial conditions are non-active and need time to absorb complex changes.

Second, it assumes that other members of the organisation do not have an active role in the strategic process. Our cases have shown that there is little to the content of strategy. Managers did not detail a "grand strategy" that should be carried out by lower levels. Instead, the role of managers was to manage complex strategic processes. The process outcome was dependent on managerial behaviour not the content of strategy. By making use of the three kinds of rational intervention we have identified, managers were able to engage and guide the efforts of all members towards desired end states. Thus, all members, including shop floor operatives are important actors in the processes.

**8.3.4. The evolution of operational performance is supportive of a business strategy but not determined by it**

Skinner saw corporate strategy as defining a business strategy which should define functional strategies. It is generally accepted that the operations function should develop the capabilities that support the current product-market strategy. Some authors, however, have criticised the notion that operations strategy is about informing senior managers about the limitations of operations. Hayes and Wheelwright (1984) speculate on whether operations would be able identify points of advantage that could not be matched by competitors and thus contribute proactively to the strategic debate. Anderson et al. (1989)
consider that corporate objectives should “be confined to what operations is capable of doing”. Hayes (1985) has argued, that particularly when the environment is difficult to forecast, manufacturing should develop its abilities independent from product-market strategies which could later be leveraged by a product-market strategy.

We observed senior managers proposing end states, defined in terms of the necessary level of performance to compete successfully. This provided the strategic stretch and gave purpose to the capability building effort that generated the expansion of productive resources. Thus, the cases studied were not essentially inward looking and were supportive of the firm’s business strategy. However, the notion that the improvement of operational performance is determined by the business strategy is not confirmed for two main reasons: (a) we have dismissed the notion of strategic fit, and (b) the strategic processes transcend the operations function.

Strategic fit means short run optimisation of production resources. We have argued here that the companies adopted a long-term framework instead of quickly matching their existing resources to business strategy. This is an emergent and introspective strategic process, connected to business strategy (gap closing process) but not determined by it. The classical order of well defined and detached corporate/business/functional strategies was also blurred. Transformation cut across the organisation both vertically and horizontally.

Because the strategic process is not determined and has a strong element of introspective transformation, Hayes’ (1985) idea that inner strengths could influence market strategy is substantiated. The evolution of second order initial conditions and the consequent development of consistent managerial behaviour and active organisational processes could prove to be a strong basis for pursuing different market strategies from the one that had guided the strategic process. When recently CIGNA was investing in a different segment of the health insurance market, we asked a manager if the advantage they enjoyed in the corporate segment could be reproduced in the new private segment. He
answered that he felt confident that, although business processes were different, the sources of advantage were already in place.

8.3.5. Explicit determination of the nature of rents

Any model of strategy should be clear about how it sees value creation and rent appropriation. We initially moved away from the monopoly rents view of Porter’s framework. According to this view, above average rents occur in those firms able to manipulate market forces. Research evidences, however, support the RBV’s view that firm specific factors are more important than the industry structure in determining the rent generated and appropriated by the firm (Cool and Schendel, 1988; Rumelt, 1991; Jacobsen, 1988; Hanson and Wernerfelt, 1989). The Ricardian view, associated with this perspective, sees the variation in rents generated by firms occurring because they are dependent on production resources that are firm specific, and whose supply is restricted in nature.

We nevertheless departed from this view. Instead of performance being underpinned by static, clearly identifiable resources, we should expect financial performance to be dependable on the development of internal processes of the firm. Thus instead of concentrating on exploring its specific assets, which would be the RBV’s advice, a firm should look for ways of developing its processes at both managerial and organisational level. The “dynamic capability” framework develops the idea of advantage being based on internal processes. Teece, Pisano and Shuen (1997) write: “competitive advantage of firms lies with its managerial and organisational processes, shaped by its (specific) assets position, and the paths available to it”.

However, it should be noted, that the case studies were operating in competitive industries where the barriers of entry were very low. Also, little value could be created outside the production processes. In industries where there are high barriers of entry, such as brand name (e.g. the beverage industry) or where value is mainly created by R&D (e.g. the pharmaceutical industry) the relationship between internal processes and financial performance may not be so evident.
We have shown here that the quality of managerial and organisational processes will determine the effectiveness of the firm’s production processes, which by its turn, will determine the value that the company will be able to deliver to its customers. We thus share the Schumpeterian perspective with the “dynamic capability” framework, where a firm enjoys rents that are above normal while its advantage lasts. This recognises the dynamic character of competition. Advantages do not last indefinitely. However, the inertial nature of the initial conditions safeguards advantage from improvement leaps. Therefore, there is no short cut to eliminating advantage. Porter (1996) says that advantage based on operational effectiveness can be quickly eliminated by the implementation of best practices. We have shown that the reality is far more demanding than that. The cases that we studied were not making any profits at the beginning of the strategic process. By the end of this process, they were enjoying consistent profitability.

8.3.6. Strategic trade-offs are necessary when the dimensions require attention to different issues

Organisations cannot be everything to every customer. To develop competitive advantage a company should restrict what it produces. This is the MSM’s view and that is supported by our observations. But achieving progress in simultaneous performance attributes depended on how far from the efficiency frontier the firm was operating. SERASA, for instance, had business processes that were so ineffective that their redesign and changes produced dramatic gains in every area. Even more important, it also depended on how much overlap there was in the issues related to each of the performance attributes.

It has been argued that one of the characteristics of the strategic processes studied here is that managers set a model of issues and answers and attempt to focus the attention of the organisation around that. Within the model some issues are tangible problems and process related. Examples are the elimination of bottlenecks and quicker set ups. Management focuses the attention of everyone to achieve results in these areas.
Each issue relates directly to one or more performance attributes. In the example above, the elimination of bottlenecks is related to productivity (costs), whereas the search for more efficient set ups occurs when the organisation is pursuing flexibility. Some issues may be placed in the overlap of two or more attributes, affecting simultaneously more than one attribute.

Consider the figure below. Each circle represent the issues that are related to only one performance criterion. The circles represent quality, flexibility, and costs. Operational issues may be placed where the circles overlap or not. Therefore some issues affect exclusively one attribute of performance while others, contained by the overlapping spaces, affect two or more performance attributes. For instance, smaller batch size is an operational issue contained by the part of the circle that represents flexibility that does not overlap, whereas elimination of WIP would be contained by the overlap of the circles that represent productive and flexibility.

We observed that services are different from manufacturing. Issues in services tend to be related to more than one performance criterion at the same time, whereas in manufacturing they tend to be of an independent nature. Consider CIGNA’s example in which by focusing the attention of the organisation on issues related to the improvement of responsiveness, it ended up improving another dimension such as quality (understood as conformance to specification). The operational issue identified was the reduction of the level of rework. The logic was that by reducing the number of claims that had to be reprocessed it would be possible to cut the turnaround time for paying claims (responsiveness). In order to get the payment form completed correctly at the first attempt (quality), CIGNA identified systematic mistakes and rooted them out by training or by simply calling attention to them. Increased responsiveness resulted automatically in higher levels of quality, and higher productivity once each member of staff was able to handle more claims.

37 This issue is further discussed in 8.3.8.
In Toshiba (manufacturing) it is evident that the issues tended to affect the attributes of performance in an independent fashion. Trade-off was necessary because managers could not call the attention to all issues at the same time for three reasons. First, managers are not ultra-rational agents. Although, due to their experience in Japan, senior managers in Toshiba had a good idea of the issues that would need to be addressed, there was an emergent element in the process. Second, the organisation needed time to absorb a limited number of issues into its organisational routines. Finally, the models of issues and answers needed to be consistent. Simultaneously highlighting the importance of, for instance, extreme care for quality details, together with a strong push for productivity and reduction of batches (flexibility) would be inconsistent and confusing.

![Figure 8.3 - Issues overlapping in services and manufacturing](image)

8.3.7. Central importance of strategic leadership

Leaders are important players in spite of lean production and MSM’s limited reference to strategic leadership. Quality models prescribe strategic leadership. However, they adopted a quality model, all cases were greatly influenced by the CEO’s personal input. Doz (1994) suggests that long lasting sources of competitive advantage need clear goals and objectives in order to be developed, diffused, integrated, and leveraged. The role of leadership is to keep the organisation continuously moving towards those goals. Strategic leadership fulfils at least three important roles: (a) facilitating the process through their
model of issues and answers, (b) involving the whole organisation, and (c) keeping the momentum of change.

Strategic leaders managed the evolution of competitive advantage not by taking dramatic action, but instead by shaping the strategic process, close to what Pettigrew and Whipp (1991) have defined as the transformational manager. By being able communicators, these leaders are able to focus the attention of organisational members, build up commitment, and motivate people to embrace higher objectives instead of short-term interests.

Senior managers had a holistic view of the organisation. The elimination of internal barriers resulting from changing managerial process, such as senior management teamwork, allowed the diligent leveraging of operational advantages through other functions, such as sales.

Another important function fulfilled by strategic leadership was to keep up the strategic momentum. The pace of change was slow but continuous. The organisations studied did not regard the change process as a project that had a beginning and a functional end. Instead, they set out on a “journey with no finish line”. Leadership, especially in the Toshiba case, also provided a purposeful sequence to the process, anchoring the development of a new attribute of performance in previous developments (Ferdows and De Meyer, 1990).

8.3.8. The importance of initial conditions

The literature on operations does not acknowledge the importance of initial conditions. Organisations are assumed to have no problem in pursuing whatever course of improvement management sets. However, outcome is not the product of deliberate choice (Porter, 1995). Choice is limited by history, and history is embedded in the companies’ initial conditions.
The importance of initial conditions can be explained through an understanding of three central concepts: that (a) the strategic process is emergent, that (b) advantage cannot be matched by improvement leaps, and that (c) the strategic process has a long-term vision and is based not on optimisation but on transformation of the productive resources.

One of the central ideas of this thesis is that those initial conditions that hinder the development of operational performance should evolve. We have demonstrated here that initial conditions are multi-dimensional and have complex relationships. Initial conditions such as managerial processes cannot be regarded within a mechanist framework in which a number of decisions will generate the desired outcome. For those dimensions, simple cause and effect relationships do not exist. The one adopted here, instead of process perspective which sees the firm in terms of structure and systems, affords us a better standpoint to appreciate the limitations of direct rationality.

Only by purposefully pursuing a line of improvement for a considerable amount of time, would it be possible for an organisation to achieve a position of competitive advantage. A number of studies support this notion. Teece et al. (1990) argue that “value augmenting strategic change” can only happen incrementally. They conclude that strategy involves “choosing among and committing to long-term paths or trajectories of competence development”. Hayes and Wheelwright (1984) had already defended the notion that only the companies that were committed to long-term incremental developments could expect their operations to carve them a position of advantage. De Meyer and Kim (1996) reinforce this idea by saying that: “strategic competencies do not happen overnight, strategic drivers cannot be implemented in a vacuum. They are established over time on the base of numerous programs”.

The argument here is that improvement leaps can reorganise production processes. The organisation may be able to eliminate structural slacks and thus considerably improve its effectiveness. Strategic operational improvement, as described here, is ultimately based on the elimination of organic slack. It is dependent on very active organisational processes, which in their turn, are dependent on the evolution of second order initial
conditions. Therefore there is no short cut to operational advantage other than a slow process of evolution.

The last concept discusses a similar issue. It says that the resource base of the firm has to be transformed. Because initial conditions are relevant, the analytical focus of strategy should not be optimisation of the existing resource base but rather the evolution of initial conditions, which should provide a new resource base. One of the corollaries from this conclusion is that management will probably have to change their ways.

8.3.9. Firm level heterogeneity is sustained by isolating mechanisms

Porter (1996) has argued that companies should focus on strategizing, or organising their production functions in distinctive ways, as opposed to economising, or looking for performance improvement. He argues that the firm should not attempt to compete in terms of operational effectiveness because best practices diffuse very fast. In fact, neither the MSM nor the lean production model possesses any elements that we can use to prove him wrong.

On the other hand, a quick glance at any industry will reveal uneven operational performance. It will only rarely be explained by innovative designs of business processes. Indeed, it is very difficult to imagine how a manufacturer could innovate so radically in the organisation of its production processes that this innovation alone could give it lasting advantage. So if successful competition is normally based on operational effectiveness, how can we explain how it lasts?

Any possible explanation has to rely on isolating mechanisms. There are three kinds. The first is path dependence. This accounts for the fact that history matters, as we have discussed above. According to the state of its initial conditions, it should be either more costly or impossible for a contender to develop these initial conditions in a shorter period of time. The contender will also be at a disadvantage with a competitor who can advance faster because it already has the right conditions.
Causal ambiguity explains that the firm itself and consequently its competitors, do not understand what the sources of its advantages are (Lippman and Rumelt, 1982). Models of “business excellence”, such as the EFQM, intend to find a way to proceed to achieve advantage. But they are far from providing a recipe of cause and effect relationship that leads to advantage. They are better understood as broad frameworks in which managers can base their models of issues and answers.

Even if we accept that the causes of advantage are to be found in the processes within the organisation that we have identified, imitation remains equally impossible. Even if the company wants to replicate the routines to underpin advantage from one site to other sites, it would be very difficult because of several factors (Szulanski, 1994). Initially the routines cannot be articulated, making it impossible to transfer unless staff who are responsible for the routines are physically moved. The routines may also have complex interactions with other routines. They may not be able to resist the change of environment, and they may have elements not previously recognised with which they have interdependence.

Even if an imitator is able to overcome the problems above and be able to explain beyond any ambiguity what causes advantage, the concept of uncertain imitability would prove an effective hurdle preventing imitation. There is no indication of the process through which such processes were developed. In addition, these processes are so socially complex that this would render imitation impossible. A specific managerial process depends on other managerial processes to work. Even more complex is the dependency of organisational processes on the proper working of all managerial processes. So, imagine that even if the routines that support the organisational process of learning could be perfectly transferred, they would not survive in an environment where the managerial processes are incompatible. Thus replicating part of the routines, in spite of the complexity of the task, is likely to generate zero benefits in the end.
8.4 The proposed model's main implications

The model introduced here presents several new insights into the evolution of operational performance that has become a source of competitive advantage. It has highlighted the importance of history carried in the firm's systems, structure, and tangible assets, and above all, in its most elementary unit of analysis, organisational routines. Process is composed of a number of organisational routines and thus is a more aggregated unit of analysis. This is the unit of analysis used in this research.

Without using processes as the main unit of analysis we would not be able to describe the process of strategic operational improvement. The resulting model highlights the interdependence of the several processes, discusses the interaction of top-down or bottom up forces of transformation, highlights the strategic importance of shop floor behaviour, and associates leanness with the overall result of the process. Next, we discuss the implications of the proposed exploratory hypotheses.

8.4.1. The evolution of initial conditions is a necessary condition for the development of operational effectiveness as a source of competitive advantage.

It has been shown that those conditions that hinder the process have to evolve, otherwise the strategic process as a whole would be jeopardised. The hypothesis was not fully supported because some dimensions of the initial conditions were not relevant in some cases. But it carries enough evidence to show that the change process is very complex and engages many facets of the organisation simultaneously.

The important corollary from this hypothesis is the multi-faceted and multi-level dimension of the evolutionary process. Several pieces of the organisational game have to be moved simultaneously. Change cannot be restricted to the production function. It affects laterally some other functions and vertically other superior hierarchical levels. If incompatible second order initial conditions remain inertial, strategic operational performance improvement will not be achieved. Consequently, no programme concerned
exclusively with the production processes, such as BPR, can aspire to become a strategic driver in isolation.

An associated corollary, less evident but nonetheless equally important, is the inefficiency of top-down initiatives. The nature of the initial conditions is immensely complex and in our case studies no manager could devise a plan that could contain all the necessary decisions. This implies that the process has to have a strong emergent component. At best, senior managers affect the course of the process by influencing how the managers below them take decisions.

This conclusion strongly supports numerous pieces of literature which suggest, as Hayes and Wheelwright (ibid.) have, that only those companies committed to vigorous and consistent processes of continuous improvement can achieve stage four of competitiveness. There is room for programmatic interference, such as process redesign, but this should be regarded as an auxiliary step. This process is emergent but should be carefully managed. It is important to highlight that by continuous improvement we do not mean a search for efficiency in the shop floor, as in lean production. We see managers giving strategic direction and carefully guiding the strategic process towards well defined objectives.

8.4.2. Managerial and organisational processes and business process control and redesign are the drivers of strategic operational performance improvement

This hypothesis was included to confirm that the elements of the model we have proposed were relevant. The confirmation of the hypothesis suggests that the analytical focus of strategy in operations is somehow different than previously assumed. The MSM would focus on the trade-off between the performance attribute alternatives and the consequent structural and infrastructural decisions. The lean manufacturing model would focus on the efficiency of the production processes to be achieved through the implementation of best practices and vigorous continuous improvements.
Our model shows that the analytical focus should be different. The organisation should pursue a process of capability building in which all the initial conditions that can potentially hinder the development of the strategic process must be altered. The focus is on managerial processes. For performance evolution to be strategically significant, management processes have to be fine-tuned and grounded on a solid model of issues and answers. Then, and only then, will the organisation be able to develop very active organisational processes, with the help of process control and redesign activities.

That does mean to say that the MSM and the lean production model should be disregarded. Trade-offs are important, but only where the issues related to different performance attributes are incompatible. The objective of the lean production model is fundamentally supported because our model also advocates that organisations should go leaner. No organisation can experience an improvement of operational performance that is strategically significant if it does not go leaner. But leanness is a consequence, not the objective of strategy. The ultimate goal of strategy is to develop active organisational processes that enable the productive processes of the organisation to deliver those strategic operational objectives envisaged by management.

8.4.3. Managerial processes should be mutually reinforcing and consistent with business processes control and redesign in order to favour the development of organisational processes

The strategic driver represented by process control and redesign has the effect of eliminating structural slack. The presence of large buffers in the production process works against the development of learning, co-ordination, and entrepreneurship behaviours. Thus, structural slacks prevent the development of organisational processes and the use of redesign and process control is an important instrument for creating the necessary conditions for the organisational process to develop.

Managerial processes represent the other strategic driver. Supporting this hypothesis, we have found that during the strategic process, managerial processes converge towards consistency. We were able to demonstrate that these processes are interdependent. If one
of the processes is incompatible, the strategic process is jeopardised. We have observed that organisations that had experienced more changes in their managerial processes also experienced more changes in their organisational processes. This is because firms can only develop organisational processes if there has been an evolution of managerial processes. Thus the change at the bottom level is dependent on changes of behaviour at upper levels. How the organisation manages its business processes, by means of control and redesign, is also an important factor regulating the development of managerial and organisational processes. This provides a link between what management does and how it affects the lower levels of the organisation.

This facet of the model is of central importance. The drivers of change have to be consistent and compatible. Advantage is based on superior operational efficiency. It depends on the intensity of organisational processes, which by its turn depends on the suitability of the managerial processes and the management of business processes.

Consequently, managers at all levels are responsible for shop floor performance. Senior and line managers cannot disassociate themselves from the effort to improve operational performance. The implication is that only deep (and probably uncomfortable) changes in managerial behaviour and systems can serve as a basis for developing lasting superior operational effectiveness. Another implication is that complex combination of several processes in the organisation which cut across hierarchical levels and function, make transferability or replicability of advantage practically impossible (refer to item 7.3.9).

8.4.4. Organisational processes are the basis of superior operational performance

Organisational processes are the core of advantage. The proprietary ingrained patterns of behaviour exhibited by the members at the bottom of the organisation are what set the operational performance of the companies in our study apart. It is important to note that we have not included the improvement of manual dexterity and gradual improvement of the production processes. This, we associate with process control.
We refer to behaviours that are routinely manifested. Processes are composed of a number of organisational routines. It has been said that the organisational routines are the very DNA of the company. Several of these routines, which are rather amorphous by themselves, can be grouped to form a process. The routines that form the categories of organisational processes proposed here were initially suggested by the literature and initial interviews and later “purified” by statistical means.

The MSM does not acknowledge the participation of shop floor operatives in the strategic process, or limit their role to participation in continuous improvements efforts normally associated with the formation of QCCs. It certainly does not see any strategic importance in the bottom levels of the organisation. It implies that a workforce could be substituted, and given enough time to develop manual dexterity and levels of performance would not suffer. However, we propose that advantage is essentially embedded in the interpersonal relationships between individuals. Therefore, substitution would result in poorer performance because many organisational routines would be lost.

We conclude that members at the bottom of the organisation carry the essence of differentiation. These processes belong to the organisation, not individuals. Few individuals can be substituted without damage to organisational processes. It should also be kept in mind that the development and the intensity of organisational processes at any time are dependent on managerial processes.

8.4.5. Organisations that develop outstanding operational effectiveness go necessarily leaner

Galbraight (1995) has argued that organisations use buffers because they cannot cope with complexity and speed. The concept of buffers used here, as explained before, goes beyond WIP. Buffers can be understood as extra staff or taking longer to perform a task. Staff and time are resources, and resources in excess are buffers.

The firm has slack built into its production process. It is of two kinds: structural and organic. To become more effective in the use of its resources, a firm has to shrink both kinds of slack. The initiatives are directed at structural changes. The organisation
redesigns and reorganises its processes. By doing so it is able to eliminate large parts of its structural slacks and move closer to the efficiency frontier. After this change is complete, organic slack is likely to remain untouched. How organisations learn to cope with speed and complexity better than other organisations usually has little to do with management or any hard resource, such as an IT system, that can also be acquired by the competitors. It has to do with the patterns of behaviour that are ingrained on the shop floor.

A virtuous cycle is created in which the elimination of structural slack and the development of supportive managerial behaviour favour the development of organisational processes that will continuously erode organic slack, incrementally pushing the organisation’s efficiency frontier ahead. The figure below summarises the idea that business processes carry slack of two distinct kinds. Thus, structural slacks are eliminated through the strategic driver that we have called process control and redesign. Organic slack is eliminated by the action of organisational processes.

![Process control and redesign](image)

**Organisational processes**

**8.5. Some issues left unexplored**

The innovative character of the research leaves us with many further opportunities for research that we were not able to explore here because of obvious limitations. The process perspective has immense research potential.
The strategic management literature since Chandler (1962) has focused on the relationship between strategy and structure or between strategy and planning systems (Ansoff, 1965) and management control systems (Anthony, 1965). It has given little opportunity for the integration of other streams of literature into the strategic debate. Garvin (1994) has noted that by focusing on the process of the organisation we can integrate important pieces of literature such as learning organisation, or business process reengineering.

This is what we have attempted in this research. Garvin (1994) has highlighted that we still do not understand how variations in strategy affect the processes in the organisation and consequently how they can affect performance. The relationship between internal processes, both managerial and organisational, remains a fertile ground for ideas and empirical research.

We have developed a model that is pioneering and general. A natural next step is to develop contingencies that are not contained here. We have proposed that organisational routines form organisational processes. Managerial processes have decisive effects on these processes. Organisational processes sustain performance, which can be understood in a number of dimensions such as quality and flexibility.

Further research could establish what the relationship between the various organisational processes and the dimensions of performance is. It is intuitive to expect that performance dimensions such as speed should have a decisive impact on the organisational process of co-ordination. There is also reason to believe that an increase in performance of any organisational process will affect costs directly because more effective organisational processes would mean better use of productive resources and elimination of organisational slack.

If such relationships could be established, then we could move to the next stage to determine more precisely how managerial processes affect each other and how they affect the organisational process as a whole or individually. We have seen in this research that
the various organisational processes do not react evenly to changes in managerial processes. Learning was demonstrated to be slower to develop.

These relationships are likely to be complex ones. But the development of a deeper understanding of such relationships would allow the development of a model of strategy sensitive to the competitive reality to which the firm belongs. This is compatible with the idea that there is not only one way of competing suggested by models of business excellence associated with quality policies and the lean production model. If there is room for strategy it is because there is room for contingency.

Another important element that needs to be explored is the role of particular initial conditions in the process. Some of these conditions may relate to research happening outside the field of operations management, but others suggest new avenues of research within the field, such as the need to improve articulation of the knowledge of the production process. It is likely that the initial conditions that are not considered important at present, increase in their importance as the organisation gets the other initial conditions right. Thus a possible way forward for companies that have accomplished appropriate managerial and organisational processes is to develop initial conditions such as knowledge.

8.6. A critical review of the employed methodology

At this point, we can evaluate the research method that was used. By acknowledging limitations in the research, we hope to make other researchers pursuing similar lines of research aware of methodological faults that might not be evident at the outset of the research. While some of these faults could have been avoided others represent compulsory trade-offs due to the limitations of resources available or the contingencies of the research. The advantages of adopting this line of research are also illustrated.

The use of grounded research was found to be a way of overcoming the lack of similar works that could provide a basic framework. After deciding on the adoption of a process
view of the organisation, it was difficult to identify the processes that should be
considered. Another problem was the insertion of important pieces of literature in the
same framework, such as those which referred to process redesign and process control.

The grounded research which was performed in one of the companies in our case studies,
and later included in the sample, was crucial in our elimination of concepts which had no
connection with reality. It also facilitated the development of new concepts, and
contributed to the organisation of the research framework. By mixing data analysis with
theory at early stages of the research we attempted to take full advantage of the flexibility
allowed by the method.

A longitudinal research that is done ex-post to the process which it attempts to analyse
faces three main problems: (a) Some of the main players may have left the company or
are unavailable, and (b) the history told by the interviewees may be biased, and (c) the
interviewees may have problems remembering events that happened a long time ago.

In the case of CIGNA, for instance, almost the totality of the senior managers had left the
company. For this reason, crucial players such as the former MD were unavailable to
contribute their view. This gap was filled with the views of other managers and a number
of publications in which the former MD was interviewed about the process of change.
The second problem refers to people who tell a different story by hiding a number of
imperfections. With the benefit of hindsight it is possible to see a coherent story line
running through it. The actors tended to emphasise their rational participation in the
process while the reality was far more ambiguous.

There is also the more prosaic issue that people had problem remembering how things
were a number of years ago. In the questionnaire we asked workers how certain
behaviours were a couple of years ago. The answers certainly carried some intrinsic
errors due to the difficulty of remembering it accurately. Another issue related to
questionnaires was its translation into Portuguese. In an attempt to reduce the possibility
that the meaning had been altered by translation, I asked some people to read the
questionnaire and explain what they had understood by the questions. As a result, some of the questions were rephrased.

Finally, we should consider the issue of generalisation. We attempt to design the research to enhance its generalisability by making it as independent as possible from the time and place that the research was performed. The findings were carefully anchored in the literature. However we cannot claim the universality of the findings. This research should be considered as a first step which has opened new opportunities. The findings need confirmation from studies that include a large sample of companies that perform below and above average in several industries. Only then we will be able to assert if it is the difference in the way which the strategic drivers determine operational performance.
Bibliography


325


Appendix 1. Factor Analysis

Here we present the results for factor analysis obtained from SPSS for windows version 6.0. Comments are framed to distinguish it from the programme output. The idea of factor analysis is to "purify" a scale, what means to increase the homogeneity of the joint meaning of the items that compound the scale. This is done by the elimination of those items whose meaning deviate from the intended one. For instance, a number of items have been selected to refer to co-ordination behaviour. Through statistical treatment we can identify items which mean something else other than co-ordination.

We present the statistical results before and after rotation. The numbers highlighted indicate the important results. Ideally, the items representing each dimension of behaviour should load on a single factor. Thus, those items that load on different factors are candidates for elimination.

1.1. Factor analysis of co-ordination with all initial factors

Analysis number 1 Listwise deletion of cases with missing values

Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>COORD1</th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD1</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD2</td>
<td>.04116</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD3</td>
<td>.07414</td>
<td>.47078</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD4</td>
<td>.26942</td>
<td>.35304</td>
<td>.29590</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>COORD5</td>
<td>.17045</td>
<td>.30735</td>
<td>.21014</td>
<td>.30864</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Determinant of Correlation Matrix = .5202462
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .67720

Bartlett Test of Sphericity = 117.94828, Significance = .00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var$^{38}$</th>
<th>Cum Pct$^{39}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.05197</td>
<td>41.0</td>
<td>41.0</td>
</tr>
<tr>
<td>2</td>
<td>1.05455</td>
<td>21.1</td>
<td>62.1</td>
</tr>
<tr>
<td>3</td>
<td>0.76803</td>
<td>15.4</td>
<td>77.5</td>
</tr>
<tr>
<td>4</td>
<td>0.62295</td>
<td>12.5</td>
<td>89.9</td>
</tr>
<tr>
<td>5</td>
<td>0.50251</td>
<td>10.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>

PC extracted 2 factors.

Factor Matrix:

<table>
<thead>
<tr>
<th>COORD1</th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
</tr>
</thead>
<tbody>
<tr>
<td>.36176</td>
<td>.74274</td>
<td>.68393</td>
<td>.71696</td>
<td>.62260</td>
</tr>
<tr>
<td>.81609</td>
<td>.39152</td>
<td>.39463</td>
<td>.23534</td>
<td>.15537</td>
</tr>
</tbody>
</table>

1.2. Analysis repeated after rotation

Final Statistics:

$^{38}$ Explains the percentage of the variation that can be explained but that factor.

$^{39}$ Accumulates the explanation power of the various factors.
Factor | Eigenvalue | Pct of Var | Cum Pct
--- | --- | --- | ---
1 | 2.05197 | 41.0 | 41.0
2 | 1.05455 | 21.1 | 62.1

Reproduced Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>COORD1</th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD1</td>
<td>.79688*</td>
<td>.09198</td>
<td>.14877</td>
<td>.18201</td>
<td>.18158</td>
</tr>
<tr>
<td>COORD2</td>
<td>.05082</td>
<td>.70495*</td>
<td>.19171</td>
<td>.08734</td>
<td>.09425</td>
</tr>
<tr>
<td>COORD3</td>
<td>.07463</td>
<td>.66249</td>
<td>.62350*</td>
<td>10158</td>
<td>15436</td>
</tr>
<tr>
<td>COORD4</td>
<td>.45143</td>
<td>.44038</td>
<td>.39748</td>
<td>.56942*</td>
<td>.17430</td>
</tr>
<tr>
<td>COORD5</td>
<td>.35203</td>
<td>.40160</td>
<td>.36450</td>
<td>.48294</td>
<td>.41177*</td>
</tr>
</tbody>
</table>

The lower left triangle contains the reproduced correlation matrix; the diagonal, reproduced commonalities; and the upper right triangle residuals between the observed correlation and the reproduced correlations. There are 10 (100%) residuals (above diagonal) with absolute values > 0.05.

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 3 iterations.

Rotated Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD1</td>
<td>.13807</td>
<td>.88194</td>
</tr>
<tr>
<td>COORD2</td>
<td>.83641</td>
<td>.07333</td>
</tr>
<tr>
<td>COORD3</td>
<td>.78866</td>
<td>.03885</td>
</tr>
<tr>
<td>COORD4</td>
<td>.47512</td>
<td>.58624</td>
</tr>
<tr>
<td>COORD5</td>
<td>.43913</td>
<td>.46791</td>
</tr>
</tbody>
</table>

Factor Transformation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>.84052</td>
<td>.54178</td>
</tr>
<tr>
<td>Factor 2</td>
<td>.54178</td>
<td>.84052</td>
</tr>
</tbody>
</table>
The results above show that the variable coord 1 loaded heavily on the second factor while the other variables loaded on factor 1. This indicates that coord 1 meaning deviates from the meaning of the remaining items. We eliminate coord 1 from the scale and reproduce the tests to assess the homogeneity of the “purified” scale.

1.3. Factor analysis eliminating co-ordination 1

Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD3</td>
<td>.47078</td>
<td>1.00000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD4</td>
<td>.35304</td>
<td>.29590</td>
<td>1.00000</td>
<td></td>
</tr>
<tr>
<td>COORD5</td>
<td>.30735</td>
<td>.21014</td>
<td>.30864</td>
<td>1.00000</td>
</tr>
</tbody>
</table>

Determinant of Correlation Matrix = .5702277

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .68956

Bartlett Test of Sphericity = 101.57763, Significance = .00000

Extraction 1 for analysis1, Principal Components Analysis (PC)

Initial Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.98215</td>
<td>49.6</td>
<td>49.6</td>
</tr>
<tr>
<td>2</td>
<td>.82848</td>
<td>20.7</td>
<td>70.3</td>
</tr>
<tr>
<td>3</td>
<td>.67474</td>
<td>16.9</td>
<td>87.1</td>
</tr>
</tbody>
</table>
PC extracted 1 factors.

Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>.78383</td>
</tr>
<tr>
<td>COORD3</td>
<td>.71549</td>
</tr>
<tr>
<td>COORD4</td>
<td>.69071</td>
</tr>
<tr>
<td>COORD5</td>
<td>.61543</td>
</tr>
</tbody>
</table>

Final Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.98215</td>
<td>49.6</td>
<td>49.6</td>
</tr>
</tbody>
</table>

Reproduced Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>.61439*</td>
<td>.09004</td>
<td>.18836</td>
<td>.17504</td>
</tr>
<tr>
<td>COORD3</td>
<td>.56082</td>
<td>.51193*</td>
<td>.19830</td>
<td>.23019</td>
</tr>
<tr>
<td>COORD4</td>
<td>.54140</td>
<td>.49420</td>
<td>.47708*</td>
<td>.11644</td>
</tr>
<tr>
<td>COORD5</td>
<td>.48239</td>
<td>.42508</td>
<td>.37876*</td>
<td>.44034</td>
</tr>
</tbody>
</table>

The lower left triangle contains the reproduced correlation matrix; the diagonal, reproduced commonalities; and the upper right triangle residuals between the observed correlation and the reproduced correlation.

There are 6 (100%) residuals (above diagonal) with absolute values > 0.05.

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

Warning # 11310
Only one factor was extracted. The solution cannot be rotated.

2.1. Factor analysis for entrepreneurship with all initial factors

Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>ENTR1</th>
<th>ENTR2</th>
<th>ENTR3</th>
<th>ENTR4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTR1</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTR2</td>
<td>.39884</td>
<td>1.00000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTR3</td>
<td>.28995</td>
<td>.40284</td>
<td>1.00000</td>
<td></td>
</tr>
<tr>
<td>ENTR4</td>
<td>.40854</td>
<td>.33485</td>
<td>.30849</td>
<td>1.00000</td>
</tr>
</tbody>
</table>

Determinant of Correlation Matrix = .5342895

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .72166

Bartlett Test of Sphericity = 115.22994, Significance = .00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.07352</td>
<td>51.8</td>
<td>51.8</td>
</tr>
<tr>
<td>2</td>
<td>.75407</td>
<td>18.9</td>
<td>70.7</td>
</tr>
<tr>
<td>3</td>
<td>.63011</td>
<td>15.8</td>
<td>86.4</td>
</tr>
<tr>
<td>4</td>
<td>.54230</td>
<td>13.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>

PC extracted 1 factors.

Factor Matrix:
Factor 1

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTR1</td>
<td>.73375</td>
</tr>
<tr>
<td>ENTR2</td>
<td>.75066</td>
</tr>
<tr>
<td>ENTR3</td>
<td>.68387</td>
</tr>
<tr>
<td>ENTR4</td>
<td>.70990</td>
</tr>
</tbody>
</table>

Final Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.07352</td>
<td>51.8</td>
<td>51.8</td>
</tr>
</tbody>
</table>

Reproduced Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>ENTR1</th>
<th>ENTR2</th>
<th>ENTR3</th>
<th>ENTR4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTR1</td>
<td>.53839*</td>
<td>.15196</td>
<td>.21184</td>
<td>.11236</td>
</tr>
<tr>
<td>ENTR2</td>
<td>.55080</td>
<td>.56349*</td>
<td>.11051</td>
<td>.19804</td>
</tr>
<tr>
<td>ENTR3</td>
<td>.50179</td>
<td>.51335</td>
<td>.46767*</td>
<td>.17699</td>
</tr>
<tr>
<td>ENTR4</td>
<td>.52089</td>
<td>.53289</td>
<td>.48548</td>
<td>.50396*</td>
</tr>
</tbody>
</table>

The lower left triangle contains the reproduced correlation matrix; the diagonal, reproduced commonalities; and the upper right triangle residuals between the observed correlation and the reproduced correlation.

There are 6 (100%) residuals (above diagonal) with absolute values > 0.05.

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

Warning # 11310

Only one factor was extracted. The solution cannot be rotated.

**3.1. Factor analysis for learning with all initial factors**

Correlation Matrix:
Determinant of Correlation Matrix = .1489295

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .85658

Bartlett Test of Sphericity = 338.01015, Significance = .00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.32429</td>
<td>41.6</td>
<td>41.6</td>
</tr>
<tr>
<td>2</td>
<td>1.00248</td>
<td>12.5</td>
<td>54.1</td>
</tr>
<tr>
<td>3</td>
<td>.88146</td>
<td>11.0</td>
<td>65.1</td>
</tr>
<tr>
<td>4</td>
<td>.67938</td>
<td>8.5</td>
<td>73.6</td>
</tr>
<tr>
<td>5</td>
<td>.63040</td>
<td>7.9</td>
<td>81.5</td>
</tr>
<tr>
<td>6</td>
<td>.56941</td>
<td>7.1</td>
<td>88.6</td>
</tr>
<tr>
<td>7</td>
<td>.47376</td>
<td>5.9</td>
<td>94.5</td>
</tr>
<tr>
<td>8</td>
<td>.43883</td>
<td>5.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

PC extracted 2 factors.

Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEARN1</td>
<td>.68040</td>
<td>-.40002</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.75024</td>
<td>-.28043</td>
</tr>
</tbody>
</table>
Final Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.32429</td>
<td>41.6</td>
<td>41.6</td>
</tr>
<tr>
<td>2</td>
<td>1.00248</td>
<td>12.5</td>
<td>54.1</td>
</tr>
</tbody>
</table>

3.2. Analysis repeated after rotation

Reproduced Correlation Matrix:

The lower left triangle contains the reproduced correlation matrix; the diagonal, reproduced communalities; and the upper right triangle residuals between the observed correlations and the reproduced correlations. There are 20 (71.0%) residuals (above diagonal) with absolute values > 0.05.

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 3 iterations.
Rotated Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEARN1</td>
<td>.78865</td>
<td>.03146</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.78273</td>
<td>.16981</td>
</tr>
<tr>
<td>LEARN3</td>
<td>.43769</td>
<td>.10783</td>
</tr>
<tr>
<td>LEARN4</td>
<td>.27685</td>
<td>.73513</td>
</tr>
<tr>
<td>LEARN5</td>
<td>.02587</td>
<td>.82872</td>
</tr>
<tr>
<td>LEARN6</td>
<td>.59403</td>
<td>.46644</td>
</tr>
<tr>
<td>LEARN7</td>
<td>.57325</td>
<td>.40777</td>
</tr>
<tr>
<td>LEARN8</td>
<td>.67847</td>
<td>.17013</td>
</tr>
</tbody>
</table>

Again we have detected the need to purify the scale. Rotation stressed the trend demonstrated by factors learn 4 and learn 5 in the first table. It is clear from the table above that learn 5 has become salient from the other factors. Learn 4 will be affected by the elimination of learn 5. The results below will determine whether it will be suitable to remain in the scale or should also be eliminated.

Factor Transformation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>.84117</td>
<td>.54077</td>
</tr>
<tr>
<td>Factor 2</td>
<td>.54077</td>
<td>.84117</td>
</tr>
</tbody>
</table>

Analysis number 1. Listwise deletion of cases with missing values

Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>LEARN1</th>
<th>LEARN2</th>
<th>LEARN3</th>
<th>LEARN4</th>
<th>LEARN5</th>
<th>LEARN6</th>
<th>LEARN7</th>
<th>LEARN8</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEARN1</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEARN2</td>
<td>.53127</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEARN3</td>
<td>.25657</td>
<td>.25246</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEARN4</td>
<td>.24392</td>
<td>.33504</td>
<td>.17755</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Determinant of Correlation Matrix = 0.1717980

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.85257

Bartlett Test of Sphericity = 316.76489, Significance = 0.00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.18855</td>
<td>45.6</td>
<td>45.6</td>
</tr>
<tr>
<td>2</td>
<td>0.87575</td>
<td>12.5</td>
<td>58.1</td>
</tr>
<tr>
<td>3</td>
<td>0.82266</td>
<td>11.8</td>
<td>69.8</td>
</tr>
<tr>
<td>4</td>
<td>0.62955</td>
<td>9.0</td>
<td>78.8</td>
</tr>
<tr>
<td>5</td>
<td>0.56658</td>
<td>8.1</td>
<td>86.9</td>
</tr>
<tr>
<td>6</td>
<td>0.48114</td>
<td>6.9</td>
<td>93.8</td>
</tr>
<tr>
<td>7</td>
<td>0.43578</td>
<td>6.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>

PC extracted 1 factors.

Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEARN1</td>
<td>0.70646</td>
</tr>
<tr>
<td>LEARN2</td>
<td>0.76760</td>
</tr>
<tr>
<td>LEARN3</td>
<td>0.44861</td>
</tr>
<tr>
<td>LEARN4</td>
<td>0.60751</td>
</tr>
<tr>
<td>LEARN6</td>
<td>0.74720</td>
</tr>
<tr>
<td>LEARN7</td>
<td>0.70972</td>
</tr>
<tr>
<td>LEARN8</td>
<td>0.68404</td>
</tr>
</tbody>
</table>
As Learn 4 loaded on factor one and factor 2 was discarded, the scale can now be considered homogeneous.

Final Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.18855</td>
<td>45.6</td>
<td>45.6</td>
</tr>
</tbody>
</table>

Reproduced Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>LEARN1</th>
<th>LEARN2</th>
<th>LEARN3</th>
<th>LEARN4</th>
<th>LEARN5</th>
<th>LEARN6</th>
<th>LEARN7</th>
<th>LEARN8</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEARN1</td>
<td>.49909*</td>
<td>.01102</td>
<td>.06036</td>
<td>.18527</td>
<td>.13503</td>
<td>.09997</td>
<td>.04962</td>
<td></td>
</tr>
<tr>
<td>LEARN2</td>
<td>.54228</td>
<td>.58921*</td>
<td>.09189</td>
<td>.13129</td>
<td>.08458</td>
<td>.10255</td>
<td>.07395</td>
<td></td>
</tr>
<tr>
<td>LEARN3</td>
<td>31693</td>
<td>.34435</td>
<td>.20125*</td>
<td>.09498</td>
<td>.05107</td>
<td>.13045</td>
<td>.08289</td>
<td></td>
</tr>
<tr>
<td>LEARN4</td>
<td>.42919</td>
<td>.46633</td>
<td>.27254</td>
<td>.36907*</td>
<td>.00129</td>
<td>.06667</td>
<td>.08881</td>
<td></td>
</tr>
<tr>
<td>LEARN6</td>
<td>.52787</td>
<td>.57355</td>
<td>.33520</td>
<td>.45394</td>
<td>.55831*</td>
<td>.05563</td>
<td>.15575</td>
<td></td>
</tr>
<tr>
<td>LEARN7</td>
<td>.50139</td>
<td>.54479</td>
<td>.31839</td>
<td>.43117</td>
<td>.53031</td>
<td>.50371*</td>
<td>.09108</td>
<td></td>
</tr>
<tr>
<td>LEARN8</td>
<td>.48325</td>
<td>.52507</td>
<td>.30686</td>
<td>.41556</td>
<td>.51111</td>
<td>.48548</td>
<td>.46790*</td>
<td></td>
</tr>
</tbody>
</table>

The lower left triangle contains the reproduced correlation matrix; the diagonal, reproduced communalties; and the upper right triangle residuals between the observed correlations and the reproduced correlations. There are 18 (85.0%) residuals (above diagonal) with absolute values > 0.05.

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.
Only one factor was extracted. The solution cannot be rotated.

4.1. Factor analysis of all dimensions of behaviour with purified scales

Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
<th>ENTR1</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD3</td>
<td>.47566</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD4</td>
<td>.35877</td>
<td>.28963</td>
<td>1.00000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD5</td>
<td>.31936</td>
<td>.22063</td>
<td>.30129</td>
<td>1.00000</td>
<td></td>
</tr>
<tr>
<td>ENTR1</td>
<td>.23181</td>
<td>.22965</td>
<td>.36042</td>
<td>.24498</td>
<td>1.00000</td>
</tr>
<tr>
<td>ENTR2</td>
<td>.28111</td>
<td>.28415</td>
<td>.31794</td>
<td>.30709</td>
<td>.38134</td>
</tr>
<tr>
<td>ENTR3</td>
<td>.27235</td>
<td>.29723</td>
<td>.28320</td>
<td>.30503</td>
<td>.29837</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>ENTR4</td>
<td>.24613</td>
<td>.19917</td>
<td>.38400</td>
<td>.28735</td>
<td>.39704</td>
</tr>
<tr>
<td>LEARN1</td>
<td>.24553</td>
<td>.24136</td>
<td>.38638</td>
<td>.16532</td>
<td>.21450</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.35457</td>
<td>.26293</td>
<td>.38313</td>
<td>.19930</td>
<td>.28674</td>
</tr>
<tr>
<td>LEARN3</td>
<td>.19258</td>
<td>.06085</td>
<td>.16979</td>
<td>.08180</td>
<td>.19085</td>
</tr>
<tr>
<td>LEARN4</td>
<td>.32702</td>
<td>.21894</td>
<td>.32441</td>
<td>.35698</td>
<td>.28745</td>
</tr>
<tr>
<td>LEARN6</td>
<td>.35904</td>
<td>.26823</td>
<td>.41489</td>
<td>.23798</td>
<td>.24119</td>
</tr>
<tr>
<td>LEARN7</td>
<td>.37325</td>
<td>.21284</td>
<td>.39339</td>
<td>.15645</td>
<td>.05287</td>
</tr>
<tr>
<td>LEARN8</td>
<td>.22929</td>
<td>.24557</td>
<td>.33969</td>
<td>.16386</td>
<td>.27772</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTR2</th>
<th>ENTR3</th>
<th>ENTR4</th>
<th>LEARN1</th>
<th>LEARN2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COORD5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTR1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTR2</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTR3</td>
<td>.41822</td>
<td>1.00000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTR4</td>
<td>.31645</td>
<td>.27995</td>
<td>1.00000</td>
<td></td>
</tr>
<tr>
<td>LEARN1</td>
<td>.28352</td>
<td>.33256</td>
<td>.32107</td>
<td>1.00000</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.33142</td>
<td>.34126</td>
<td>.34305</td>
<td>.52141</td>
</tr>
<tr>
<td>LEARN3</td>
<td>.20055</td>
<td>.07901</td>
<td>.17604</td>
<td>.24714</td>
</tr>
<tr>
<td>LEARN4</td>
<td>.41732</td>
<td>.29941</td>
<td>.29146</td>
<td>.24574</td>
</tr>
<tr>
<td>LEARN6</td>
<td>.37573</td>
<td>.31338</td>
<td>.38146</td>
<td>.39935</td>
</tr>
<tr>
<td>LEARN7</td>
<td>.17428</td>
<td>.23374</td>
<td>.21835</td>
<td>.40669</td>
</tr>
<tr>
<td>LEARN8</td>
<td>.22635</td>
<td>.32258</td>
<td>.27644</td>
<td>.42974</td>
</tr>
</tbody>
</table>

| COORD2 |        |        |        |        |
| COORD3 |        |        |        |        |
| COORD4 |        |        |        |        |
| COORD5 |        |        |        |        |
| ENTR1  |        |        |        |        |
| ENTR2  |        |        |        |        |
| ENTR3  |        |        |        |        |
| ENTR4  |        |        |        |        |
| LEARN1 |        |        |        |        |
| LEARN2 |        |        |        |        |
| LEARN3 | 1.00000|        |        |        |
| LEARN4 | .18239 | 1.00000|        |        |
| LEARN6 | .29598 | .44945 | 1.00000|        |
| LEARN7 | .18814 | .37711 | .48067 | 1.00000|        |
| LEARN8 | .22051 | .32923 | .36170 | .40182 | 1.00000|
Determinant of Correlation Matrix = 0.0128147

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.89211

Bartlett Test of Sphericity = 750.15796, Significance = 0.00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.23371</td>
<td>34.9</td>
<td>34.9</td>
</tr>
<tr>
<td>2</td>
<td>1.30835</td>
<td>8.7</td>
<td>43.6</td>
</tr>
<tr>
<td>3</td>
<td>1.08670</td>
<td>7.2</td>
<td>50.9</td>
</tr>
<tr>
<td>4</td>
<td>0.95088</td>
<td>6.3</td>
<td>57.2</td>
</tr>
<tr>
<td>5</td>
<td>0.89061</td>
<td>5.9</td>
<td>63.1</td>
</tr>
<tr>
<td>6</td>
<td>0.81649</td>
<td>5.4</td>
<td>68.6</td>
</tr>
<tr>
<td>7</td>
<td>0.69431</td>
<td>4.6</td>
<td>73.2</td>
</tr>
<tr>
<td>8</td>
<td>0.64313</td>
<td>4.3</td>
<td>77.5</td>
</tr>
<tr>
<td>9</td>
<td>0.59148</td>
<td>3.9</td>
<td>81.4</td>
</tr>
<tr>
<td>10</td>
<td>0.54632</td>
<td>3.6</td>
<td>85.1</td>
</tr>
<tr>
<td>11</td>
<td>0.53360</td>
<td>3.6</td>
<td>88.6</td>
</tr>
<tr>
<td>12</td>
<td>0.48299</td>
<td>3.2</td>
<td>91.9</td>
</tr>
<tr>
<td>13</td>
<td>0.44468</td>
<td>3.0</td>
<td>94.8</td>
</tr>
<tr>
<td>14</td>
<td>0.40317</td>
<td>2.7</td>
<td>97.5</td>
</tr>
<tr>
<td>15</td>
<td>0.37356</td>
<td>2.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

PC extracted 3 factors.

Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>0.59507</td>
<td>0.09055</td>
<td>0.48830</td>
</tr>
<tr>
<td>COORD3</td>
<td>0.50153</td>
<td>0.21108</td>
<td>0.49647</td>
</tr>
<tr>
<td>COORD4</td>
<td>0.65830</td>
<td>0.00063</td>
<td>0.00332</td>
</tr>
<tr>
<td>COORD5</td>
<td>0.49922</td>
<td>0.42837</td>
<td>0.15453</td>
</tr>
<tr>
<td>ENTR1</td>
<td>0.52012</td>
<td>0.41504</td>
<td>0.41914</td>
</tr>
</tbody>
</table>
### 4.2 Analysis repeated after rotation

Final Statistics:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Pct of Var</th>
<th>Cum Pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.23371</td>
<td>34.9</td>
<td>34.9</td>
</tr>
<tr>
<td>2</td>
<td>1.30835</td>
<td>8.7</td>
<td>43.6</td>
</tr>
<tr>
<td>3</td>
<td>1.08670</td>
<td>7.2</td>
<td>50.9</td>
</tr>
</tbody>
</table>

Reproduced Correlation Matrix:

<table>
<thead>
<tr>
<th></th>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
<th>ENTR1</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>.60074*</td>
<td>.08433</td>
<td>.03465</td>
<td>.09195</td>
<td>.08939</td>
</tr>
<tr>
<td>COORD3</td>
<td>.55999</td>
<td>.54257*</td>
<td>.43338*</td>
<td>.02812</td>
<td>.01916</td>
</tr>
<tr>
<td>COORD4</td>
<td>.39342</td>
<td>.33194</td>
<td>.45659*</td>
<td>.12769</td>
<td>.41751</td>
</tr>
<tr>
<td>COORD5</td>
<td>.41131</td>
<td>.32942</td>
<td>.34126</td>
<td>.37267</td>
<td>.61846*</td>
</tr>
<tr>
<td>ENTR1</td>
<td>.14242</td>
<td>.14037</td>
<td>.39616</td>
<td>.43403</td>
<td>.53183</td>
</tr>
<tr>
<td>ENTR2</td>
<td>.31499</td>
<td>.30174</td>
<td>.37988</td>
<td>.39249</td>
<td>.39219</td>
</tr>
<tr>
<td>ENTR3</td>
<td>.37260</td>
<td>.34751</td>
<td>.37988</td>
<td>.39249</td>
<td>.39219</td>
</tr>
<tr>
<td>ENTR4</td>
<td>.20486</td>
<td>.16909</td>
<td>.38155</td>
<td>.31581</td>
<td>.50987</td>
</tr>
<tr>
<td>LEARN1</td>
<td>.27683</td>
<td>.17273</td>
<td>.41318</td>
<td>.13638</td>
<td>.22965</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.35379</td>
<td>.45790</td>
<td>.20694</td>
<td>.26429</td>
<td>.25149</td>
</tr>
<tr>
<td>LEARN3</td>
<td>.00335</td>
<td>.06608</td>
<td>.24234</td>
<td>.01156</td>
<td>.24993</td>
</tr>
<tr>
<td>LEARN4</td>
<td>.40379</td>
<td>.36001</td>
<td>.40970</td>
<td>.36763</td>
<td>.35191</td>
</tr>
<tr>
<td>LEARN5</td>
<td>.43029</td>
<td>.34706</td>
<td>.47369</td>
<td>.30625</td>
<td>.30632</td>
</tr>
<tr>
<td>LEARN6</td>
<td>.44608</td>
<td>.33214</td>
<td>.39269</td>
<td>.12562</td>
<td>.01635</td>
</tr>
<tr>
<td>LEARN7</td>
<td>.27459</td>
<td>.17946</td>
<td>.39748</td>
<td>.15012</td>
<td>.23385</td>
</tr>
<tr>
<td>LEARN8</td>
<td>.36023</td>
<td>.36806</td>
<td>.15709</td>
<td>.01599</td>
<td>.32119</td>
</tr>
<tr>
<td>COORD2</td>
<td>ENTR2</td>
<td>ENTR3</td>
<td>ENTR4</td>
<td>LEARN1</td>
<td>LEARN2</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>.03388</td>
<td>.03388</td>
<td>.03388</td>
<td>.03388</td>
<td>.03388</td>
<td>.03388</td>
</tr>
<tr>
<td>.01759</td>
<td>.01759</td>
<td>.01759</td>
<td>.01759</td>
<td>.01759</td>
<td>.01759</td>
</tr>
<tr>
<td>.07822</td>
<td>.07822</td>
<td>.07822</td>
<td>.07822</td>
<td>.07822</td>
<td>.07822</td>
</tr>
<tr>
<td>.12694</td>
<td>.12694</td>
<td>.12694</td>
<td>.12694</td>
<td>.12694</td>
<td>.12694</td>
</tr>
<tr>
<td>.15049</td>
<td>.15049</td>
<td>.15049</td>
<td>.15049</td>
<td>.15049</td>
<td>.15049</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTR2</th>
<th>.52282*</th>
<th>.01433</th>
<th>.14870</th>
<th>.09197</th>
<th>.47174*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTR3</td>
<td>.43254</td>
<td>.38976*</td>
<td>.09197</td>
<td>.05953</td>
<td>.01322</td>
</tr>
<tr>
<td>ENTR4</td>
<td>.46514</td>
<td>.37192</td>
<td>.47174*</td>
<td>.02175</td>
<td>.02969</td>
</tr>
<tr>
<td>LEARN1</td>
<td>.26414</td>
<td>.27303</td>
<td>.34282</td>
<td>.54703*</td>
<td>.03663</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.31803</td>
<td>.32803</td>
<td>.37274</td>
<td>.55804</td>
<td>.58162*</td>
</tr>
<tr>
<td>LEARN3</td>
<td>.18888</td>
<td>.14489</td>
<td>.29630</td>
<td>.38081</td>
<td>.36416</td>
</tr>
<tr>
<td>LEARN4</td>
<td>.40993</td>
<td>.38720</td>
<td>.36665</td>
<td>.34215</td>
<td>.39452</td>
</tr>
<tr>
<td>LEARN6</td>
<td>.37936</td>
<td>.38349</td>
<td>.38509</td>
<td>.49773</td>
<td>.53974</td>
</tr>
<tr>
<td>LEARN7</td>
<td>.12974</td>
<td>.22832</td>
<td>.16748</td>
<td>.52182</td>
<td>.54827</td>
</tr>
<tr>
<td>LEARN8</td>
<td>.26759</td>
<td>.27249</td>
<td>.33388</td>
<td>.50996</td>
<td>.52372</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEARN3</th>
<th>LEARN4</th>
<th>LEARN6</th>
<th>LEARN7</th>
<th>LEARN8</th>
</tr>
</thead>
<tbody>
<tr>
<td>.18923</td>
<td>.07677</td>
<td>.07125</td>
<td>.07283</td>
<td>.04530</td>
</tr>
<tr>
<td>.14107</td>
<td>.07882</td>
<td>.11930</td>
<td>.06612</td>
<td>.12693</td>
</tr>
<tr>
<td>.07254</td>
<td>.08528</td>
<td>.05880</td>
<td>.00070</td>
<td>.05779</td>
</tr>
<tr>
<td>.07024</td>
<td>.01065</td>
<td>.07174</td>
<td>.03082</td>
<td>.01373</td>
</tr>
<tr>
<td>.05908</td>
<td>.06445</td>
<td>.06513</td>
<td>.06922</td>
<td>.04387</td>
</tr>
<tr>
<td>.01166</td>
<td>.00739</td>
<td>.00362</td>
<td>.04455</td>
<td>.04124</td>
</tr>
<tr>
<td>.06588</td>
<td>.08780</td>
<td>.06961</td>
<td>.00542</td>
<td>.05099</td>
</tr>
<tr>
<td>.12026</td>
<td>.07519</td>
<td>.00363</td>
<td>.05086</td>
<td>.05744</td>
</tr>
<tr>
<td>.13368</td>
<td>.09641</td>
<td>.09838</td>
<td>.11513</td>
<td>.08022</td>
</tr>
<tr>
<td>.11244</td>
<td>.07103</td>
<td>.05614</td>
<td>.09916</td>
<td>.07647</td>
</tr>
</tbody>
</table>

343
The lower left triangle contains the reproduced correlation matrix; the diagonal, reproduced communalities; and the upper right triangle residuals between the observed correlations and the reproduced correlations.

There are 62 (59.0%) residuals (above diagonal) with absolute values > 0.05.

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 6 iterations.

Rotated Factor Matrix:

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>.24811</td>
<td>.11564</td>
<td>.72513</td>
</tr>
<tr>
<td>COORD3</td>
<td>.09711</td>
<td>.13752</td>
<td>.71710</td>
</tr>
<tr>
<td>COORD4</td>
<td>.44091</td>
<td>.35612</td>
<td>.33489</td>
</tr>
<tr>
<td>COORD5</td>
<td>.00049</td>
<td>.46121</td>
<td>.49384</td>
</tr>
<tr>
<td>ENTR1</td>
<td>.12442</td>
<td>.77593</td>
<td>.03009</td>
</tr>
<tr>
<td>ENTR2</td>
<td>.16709</td>
<td>.64799</td>
<td>.27388</td>
</tr>
<tr>
<td>ENTR3</td>
<td>.21282</td>
<td>.45705</td>
<td>.36813</td>
</tr>
<tr>
<td>ENTR4</td>
<td>.32011</td>
<td>.60280</td>
<td>.07685</td>
</tr>
<tr>
<td>LEARN1</td>
<td>.70931</td>
<td>.17793</td>
<td>.11069</td>
</tr>
<tr>
<td>LEARN2</td>
<td>.69807</td>
<td>.22038</td>
<td>.21391</td>
</tr>
<tr>
<td>LEARN3</td>
<td>.50699</td>
<td>.24890</td>
<td>.20854</td>
</tr>
</tbody>
</table>
The final results show that the items coherently load on three factors. The meanings are not completely orthogonal as demonstrated by the table above. This means that they share something in common; but because they load on three different factors we can be sure that each category has a distinctive meaning.
Appendix 2. Reliability Analysis

1.1 Introduction

Reliability analysis assesses the error that is inherent to the scale. The objective is to ensure that the error inherent in our scale falls within acceptable limits. Below we show the output of SPSS for Windows version 6.0. The descriptive statistics and calculations are shown. Of special interest is the last table where reliability is calculated when each item is excluded, one at the time. The result shows that in none of the possible cases, the elimination of an item produces a significant increase in the reliability of the scale. The resulting reliability coefficient is considered appropriate.

1.2. Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std Dev</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>COORD2</td>
<td>3.1955</td>
<td>179.0</td>
</tr>
<tr>
<td>2.</td>
<td>COORD3</td>
<td>3.5810</td>
<td>179.0</td>
</tr>
<tr>
<td>3.</td>
<td>COORD4</td>
<td>3.3073</td>
<td>179.0</td>
</tr>
<tr>
<td>4.</td>
<td>COORD5</td>
<td>3.6313</td>
<td>179.0</td>
</tr>
<tr>
<td>5.</td>
<td>ENTR1</td>
<td>3.6816</td>
<td>179.0</td>
</tr>
<tr>
<td>6.</td>
<td>ENTR2</td>
<td>4.0000</td>
<td>179.0</td>
</tr>
<tr>
<td>7.</td>
<td>ENTR3</td>
<td>3.5531</td>
<td>179.0</td>
</tr>
<tr>
<td>8.</td>
<td>ENTR4</td>
<td>3.6034</td>
<td>179.0</td>
</tr>
<tr>
<td>9.</td>
<td>LEARN1</td>
<td>2.9721</td>
<td>179.0</td>
</tr>
<tr>
<td>10.</td>
<td>LEARN2</td>
<td>3.1006</td>
<td>179.0</td>
</tr>
<tr>
<td>11.</td>
<td>LEARN3</td>
<td>3.3799</td>
<td>179.0</td>
</tr>
<tr>
<td>12.</td>
<td>LEARN4</td>
<td>3.5363</td>
<td>179.0</td>
</tr>
<tr>
<td>13.</td>
<td>LEARN5</td>
<td>3.8771</td>
<td>179.0</td>
</tr>
<tr>
<td>14.</td>
<td>LEARN6</td>
<td>3.1788</td>
<td>179.0</td>
</tr>
<tr>
<td>15.</td>
<td>LEARN8</td>
<td>2.9162</td>
<td>179.0</td>
</tr>
</tbody>
</table>
1.3. Covariance Matrix

<table>
<thead>
<tr>
<th>COORD2</th>
<th>COORD3</th>
<th>COORD4</th>
<th>COORD5</th>
<th>ENTR1</th>
</tr>
</thead>
<tbody>
<tr>
<td>.7087</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.3520</td>
<td>.7729</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.2935</td>
<td>.2474</td>
<td>.9444</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.2129</td>
<td>.1536</td>
<td>.2319</td>
<td>.6273</td>
<td></td>
</tr>
<tr>
<td>.1581</td>
<td>.1636</td>
<td>.2838</td>
<td>.1572</td>
<td>.6565</td>
</tr>
<tr>
<td>.2022</td>
<td>.2135</td>
<td>.2640</td>
<td>.2079</td>
<td>.2640</td>
</tr>
<tr>
<td>.1946</td>
<td>.2218</td>
<td>.2336</td>
<td>.2051</td>
<td>.2052</td>
</tr>
<tr>
<td>.1679</td>
<td>.1419</td>
<td>.3023</td>
<td>.1844</td>
<td>.2606</td>
</tr>
<tr>
<td>.1965</td>
<td>.2017</td>
<td>.3569</td>
<td>.1245</td>
<td>.1652</td>
</tr>
<tr>
<td>.2724</td>
<td>.2109</td>
<td>.3397</td>
<td>.1440</td>
<td>.2120</td>
</tr>
<tr>
<td>.1276</td>
<td>.0421</td>
<td>.1298</td>
<td>.0510</td>
<td>.1216</td>
</tr>
<tr>
<td>.2429</td>
<td>.1698</td>
<td>.2781</td>
<td>.2494</td>
<td>.2054</td>
</tr>
<tr>
<td>.2433</td>
<td>.1898</td>
<td>.3245</td>
<td>.2409</td>
<td>.1573</td>
</tr>
<tr>
<td>.2963</td>
<td>.1764</td>
<td>.3605</td>
<td>.1168</td>
<td>.0404</td>
</tr>
<tr>
<td>.1794</td>
<td>.2006</td>
<td>.3068</td>
<td>.1206</td>
<td>.2091</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTR2</th>
<th>ENTR3</th>
<th>ENTR4</th>
<th>LEARN1</th>
<th>LEARN2</th>
</tr>
</thead>
<tbody>
<tr>
<td>.7303</td>
<td>.7205</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.3034</td>
<td>.1925</td>
<td>.6564</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.2191</td>
<td>.2683</td>
<td>.2473</td>
<td>.9037</td>
<td></td>
</tr>
<tr>
<td>.2303</td>
<td>.2643</td>
<td>.2536</td>
<td>.4523</td>
<td>.8325</td>
</tr>
<tr>
<td>.2584</td>
<td>.0528</td>
<td>.1122</td>
<td>.1848</td>
<td>.1807</td>
</tr>
<tr>
<td>.1348</td>
<td>.2242</td>
<td>.2083</td>
<td>.2061</td>
<td>.2604</td>
</tr>
<tr>
<td>.3146</td>
<td>.2144</td>
<td>.2487</td>
<td>.3055</td>
<td>.3551</td>
</tr>
<tr>
<td>.2584</td>
<td>.1871</td>
<td>.1668</td>
<td>.3646</td>
<td>.3864</td>
</tr>
<tr>
<td>.1404</td>
<td>.2545</td>
<td>.2081</td>
<td>.3797</td>
<td>.3793</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEARN3</th>
<th>LEARN4</th>
<th>LEARN6</th>
<th>LEARN7</th>
<th>LEARN8</th>
</tr>
</thead>
<tbody>
<tr>
<td>.6189</td>
<td>.7782</td>
<td>.6477</td>
<td>.8892</td>
<td>.8637</td>
</tr>
<tr>
<td>.1266</td>
<td>.3191</td>
<td>.3648</td>
<td>.3521</td>
<td></td>
</tr>
<tr>
<td>.1874</td>
<td>.3137</td>
<td>.2705</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.1396</td>
<td>.2699</td>
<td>.3521</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Cases = 179.0
### Statistics for Scale

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
<th>Std Dev</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.5140</td>
<td>58.6108</td>
<td>7.6558</td>
<td>15</td>
</tr>
</tbody>
</table>

### Item Means

<table>
<thead>
<tr>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
<th>Max/Min</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4343</td>
<td>2.9162</td>
<td>4.0000</td>
<td>1.0838</td>
<td>1.3716</td>
<td>.1018</td>
</tr>
</tbody>
</table>

### Inter-item covariances

<table>
<thead>
<tr>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
<th>Max/Min</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>.2250</td>
<td>.0404</td>
<td>.4523</td>
<td>.4119</td>
<td>11.1966</td>
<td>.0064</td>
</tr>
</tbody>
</table>

### Item-total Statistics

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale mean if item is deleted</th>
<th>Scale Variance if item deleted</th>
<th>Corrected item-total correlation</th>
<th>Squared Multiple Correlation</th>
<th>Alpha if item deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD2</td>
<td>48.3184</td>
<td>51.6227</td>
<td>.5191</td>
<td>.3759</td>
<td>.8549</td>
</tr>
<tr>
<td>COORD3</td>
<td>47.9330</td>
<td>52.4674</td>
<td>.4217</td>
<td>.2883</td>
<td>.8598</td>
</tr>
<tr>
<td>COORD4</td>
<td>48.2067</td>
<td>49.7604</td>
<td>.5766</td>
<td>.3648</td>
<td>.8517</td>
</tr>
<tr>
<td>COORD5</td>
<td>47.8827</td>
<td>53.1828</td>
<td>.4156</td>
<td>.2687</td>
<td>.8598</td>
</tr>
<tr>
<td>ENTR1</td>
<td>47.8324</td>
<td>52.7470</td>
<td>.4425</td>
<td>.3220</td>
<td>.8586</td>
</tr>
<tr>
<td>ENTR2</td>
<td>47.5140</td>
<td>51.4984</td>
<td>.5203</td>
<td>.3575</td>
<td>.8548</td>
</tr>
<tr>
<td>ENTR3</td>
<td>47.9609</td>
<td>51.8468</td>
<td>.4944</td>
<td>.3029</td>
<td>.8561</td>
</tr>
<tr>
<td>ENTR4</td>
<td>47.9106</td>
<td>52.1268</td>
<td>.4981</td>
<td>.2973</td>
<td>.8560</td>
</tr>
<tr>
<td>LEARN1</td>
<td>48.5419</td>
<td>50.3395</td>
<td>.5462</td>
<td>.3880</td>
<td>.8534</td>
</tr>
<tr>
<td>LEARN2</td>
<td>48.4134</td>
<td>49.8394</td>
<td>.6162</td>
<td>.4439</td>
<td>.8496</td>
</tr>
<tr>
<td>LEARN3</td>
<td>48.1341</td>
<td>54.4875</td>
<td>.3017</td>
<td>.1515</td>
<td>.8648</td>
</tr>
<tr>
<td>LEARN4</td>
<td>47.9777</td>
<td>51.0557</td>
<td>.5376</td>
<td>.3566</td>
<td>.8539</td>
</tr>
<tr>
<td>LEARN6</td>
<td>47.6369</td>
<td>50.6034</td>
<td>.6427</td>
<td>.4652</td>
<td>.8491</td>
</tr>
<tr>
<td>LEARN7</td>
<td>48.3352</td>
<td>50.5095</td>
<td>.5062</td>
<td>.4295</td>
<td>.8565</td>
</tr>
<tr>
<td>LEARN8</td>
<td>48.5978</td>
<td>50.8036</td>
<td>.5241</td>
<td>.3403</td>
<td>.8546</td>
</tr>
</tbody>
</table>
1.4. Final result

Reliability Coefficients  15 items

<table>
<thead>
<tr>
<th>Alpha = .8639</th>
<th>Standardized item alpha = .8631</th>
</tr>
</thead>
</table>

Appendix 3

Questionnaire

In this questionnaire we will be asking you to answer 18 questions. The objective is to draw a picture of the collective behaviour, how it has evolved, and its connection to continuous improvement.

For each question you will find a scale which ranges from 1 to 5, where 1 and 5 are extreme situations. The idea is to measure the intensity of that behaviour. Another similar scale measures the intensity of the change of that behaviour.

Please mark these two scales in all questions.

Finally, we ask you to illustrate one or more situations that resulted in an improvement of the production process. Remember that all sorts of comments are welcomed. Feel free to attach any extra space that you find necessary. Please note that the information you give here is confidential and you are not asked to identify yourself.

Thanks very much for your collaboration.

Fabio Alher
Co-ordination

1. Do you see the outcome of other people’s jobs influencing how well you perform your task?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all.</td>
<td></td>
<td></td>
<td></td>
<td>Very much.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

2. Does the information reach you when you need it?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost never.</td>
<td></td>
<td></td>
<td></td>
<td>Always.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

3. Do people communicate frequently?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all.</td>
<td></td>
<td></td>
<td></td>
<td>Very frequently.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>
4. Do people hide information in order to avoid blaming in case something goes wrong?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always. People tend to dissociate themselves from problematic situations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Never. There is no fear of blaming.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

5. Are people helpful?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Always.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

**Entrepreneurship**

Do you see yourself and your peers keen on breaking from past behaviours and/or practices in order to improve the way tasks are performed?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Always.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>
2. Do you see yourself and your peers keen on striving for continuous improvements and moving beyond what would be considerate adequate?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO, not at all.</td>
<td></td>
<td></td>
<td></td>
<td>YES, very much.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

3. Do you see yourself and your peers keen on developing personal links with people working in your specific function or across boundaries?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO, not at all</td>
<td></td>
<td></td>
<td></td>
<td>Yes, very much</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

4. Do you see yourself and your peers keen on tackling problems and dilemmas and proposing creative solutions when a problem occurs?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td>Yes, very much</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>
5. Do you see yourself and your peers keen on understanding what caused problems even if it means challenging previous assumptions?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td>Yes, very much</td>
</tr>
</tbody>
</table>

Learning

1. When one has a suggestion on how to improve the production processes, how influential is he/she in actually implementing the change?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not influential at all</td>
<td></td>
<td></td>
<td></td>
<td>Very influential</td>
</tr>
</tbody>
</table>

2. When a suggestion is presented (by workers or management alike) do people openly discuss and clarify the suggestions presented in order to eliminate ambiguity?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td>Always</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>
3. When a suggestion is accepted is it tested (by any sort of experimentation) before being put into practice?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. When an unexpected situation arises (provoking variation in the production process), do you (or someone) attempt to articulate what caused it?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. When a problem occurs and a solution is found, is it documented?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Do you network with other colleagues working in our function as well as other functions?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A little</td>
<td></td>
<td></td>
<td></td>
<td>A lot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

7. Is knowledge concentrated on one a few “technical” individuals?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No, it is shared by all members</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>

8. Do people question what management assumes to be the “way of doing things around here”?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Always</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has not changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It has changed completely</td>
</tr>
</tbody>
</table>
Please describe and comment on the space below one or more circumstances that resulted in the improvement of the production processes. Clarify the roles that you and your peers' and management in making it happen: