Managerial preconditions for implementing major changes in corporate processes

Managerial Preconditions for Implementing Major Changes in Corporate Processes

By

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Declaration

No part of the work described in this Thesis has been submitted in support of an application for any other degree or qualification of this or any other University or any other institute of learning.

Summary

This thesis investigates whether management behaviour impairs major changes in corporate processes. The focused areas were new complex product development process and business process re-engineering in post privatisation companies.

Several surveys were carried out in Brazil, North America, and Europe involving companies either that deal with new complex product development or companies that have experienced a privatisation process. An aircraft manufacturer company, located in Brazil, was selected as the case study company. The author selected top 10 pre-conditions to succeed in a Business Process Re-engineering (BPR) endeavour and observed their evolution in the case study company.

The most important contribution of this thesis is related to the identification of a pattern in the case study company to deal with major changes in corporate process. The investigations at the case study company indicated that if the top ten BPR pre-conditions to succeed evolve, it is likely to have success in the BPR activities.

The achieved results are compared with an extensive literature review, which covers topics such as cultural change, management behaviour, business process re-engineering, new product development, integrated product development, concurrent engineering, privatisation process, and organisational changes.

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Main Abbreviations

BPR – Business Process Re-engineering

CE – Concurrent Engineering

DFMA – Design for Manufacture and Assembly

DMRG – Design Methods Research Group

DTC – Design to Cost

IDA – Institute of Defence Analysis

IPD – Integrated Product Development

IT – Information Technology

MPR – Mind Process Re-engineering

NCPD – New Complex Product Development

NLP – Neuro Linguistic Programming

TOR – Transformation of the Organisation for Results

TQM – Total Quality Management

UK – United Kingdom

Thesis content overview

Chapter 1 – Aims and Objectives: describes the thesis aims and objectives.

Chapter 2 – Literature Review: summarises the literature survey and describes the main definitions adopted by the author.

Chapter 3 – Research Hypothesis: the hypothesis is stated and the structure of subsequent research studies is discussed.

Chapter 4 – Research studies on New Complex Product Development Process: describes survey carried out with UK companies focused on design methods and survey carried out with North American companies focused on Integrated Product Development.

Chapter 5 - Research studies on Business Process Re-engineering: describes surveys carried out with UK and Brazilian privatised companies focused on Business Process Re-engineering .

Chapter 6 - Research studies in the Case Study Company: describes how Embraer, a privatised Brazilian aircraft manufacturer, evolved.

Chapter 7 – Discussions on the Obtained Results and Literature Survey: compares the most important finding with the theory described in the Literature Survey

Chapter 8 – Conclusions: discusses the veracity of the hypothesis, success and limitations of the work, generalisation of the results, recommendation for the industry, review of research methods, and it proposes further work to be carried out.

Chapter 9 – References: It describes the main references (books, articles, etc.), which supported thesis elaboration.

Appendix I – "Questionnaire about Business Process Re-engineering" It outlines the questionnaire utilised for survey on Business Process Re-engineering.

1. Chapter 1 – Aims and Objectives

This thesis aims to investigate whether management behaviour impairs major changes in corporate processes.

Objectives:

- To test the stated hypothesis "major changes in corporate processes are impaired by management behaviour" in two focused areas:

  - Re-engineering of the New Complex Product Development Process
  - Business Process Re-engineering in Post Privatisation companies

- To relate available literature with actual data coming from surveyed companies, including a case study company in the aeronautical sector.

- To identify a pattern that leads to successful implementation of changes in corporate processes.

- To reveal lessons learned that could be useful for the industrial sector when major processes changes are required.

The term behaviour, referred in this thesis, is based on Huczynski (1991) definition, as follows:

"Behaviour is the term given to things that human beings do and can be directly detected by the senses of others". According to him, formal organisations exist to achieve particular goals through the behaviour of their members. In addition, he says that learning is the process of acquiring knowledge through experience, which leads to a change in behaviour.

Newcomb (1965) says that people's attitudes drive their behaviour in a given environment. Attitude is a driving force that prompts a person to act. He points out that behaviour is resultant from multiple attitudes.

The author considers management behaviour as the result of a set of leaders' attitudes, which are converted in leaders' behaviour in a corporate environment. The management behaviour may be constructive or destructive towards a corporate process change. The destructive ones are considered resistance to change.

The term Business Process Re-engineering (BPR), referred in this thesis, is based on Hammer and Champy (1993) definition, as follows:
"Processes is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer. Re-engineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed".

The author established a definition for a complex product based on the following factors:

- Development cycle time (longer than 1 year)
- Development cost (higher than US$ 10 million)
- Number of involved technologies (higher than 50). One technology is considered as a group of knowledge areas required to develop a function of the product under development (for an aeroplane development examples of technologies are: structures, aerodynamics, on-board systems – avionics, air-conditioning, electrical, hydraulics)
- Number of suppliers (higher than 50)

As an example, for the **commuter aircraft segment of the market,** the author considered the following numbers:

Development cycle: 2 to 5 years (usual period from preliminary analysis until the flight of the first prototype, for projects that start from scratch).
Development cost: Usually from US$ 50 million to US$ 800 million
Number of involved technologies: Not less than one hundred technologies are needed to develop an aircraft.
Number of suppliers: not less than 300

The numbers above indicate that an aircraft is a highly complex product.

To better explain the definition of complex product above described, the following table compares several products, estimating their degree of complexity in the author's point of view. Automobile and aircraft are two very complex products whilst a hydraulic pump is a simple product. The definition of complex product is mainly based on the author's practical experience. It was defined to allow a better understanding of the thesis context.

	Hydraulic Pump	Washing Machine	Computer	Automobile	Aircraft
Development cycle	< 3 months	< 6 months	< 2 years	> 2 years	> 3 years
Development cost (US$ Million)	< 0.10	< 0.50	< 10	> 10	> 50
Involved technologies	< 10	< 50	< 50	> 50	>100
Suppliers	< 10	< 30	< 50	> 50	> 100

Table 1.1 Degree of complexity for several products

2. Chapter 2 – Literature Review

Summary

This literature survey gathered information mainly about management and organisational behaviour, culture and organisational change, business process re-engineering, new product development process, privatisation process and managerial trends in order to support the aim of the thesis described in chapter 1. This chapter describes the main findings in the mentioned areas. Most of the information was obtained from books, journal papers and magazine articles in Universities libraries and they are summarised in this chapter.

2.1 Business strategies and organisational changes

Wheelen and Hunger (1995) state that corporate strategy specifies the firm's orientation towards growth and the industries or markets in which it will compete. For multi-business corporations operating in more than one industry or market, corporate strategy also includes decisions regarding the flow of financial and other resources to and from their business units. According to Wheelen and Hunger (1995), corporate strategy embodies three general orientations: *growth, stability and retrenchment.* Figure 2.1 identifies nine cells containing corporate strategies that fit under mentioned orientations.

		Business Strengths / Competitive Position		
Industry Attractiveness		**Strong**	**Average**	**Weak**
	High	*1* ***Growth:*** Concentration via Vertical Integration	*2* ***Growth:*** Concentration via Horizontal Integration	*3* ***Retrenchment*** Turnaround
	Medium	*4* ***Stability*** Pause or Proceed with Caution	*5* ***Growth*** Concentration via Horizontal Integration Stability: No Change or Profit Strategy	*6* ***Retrenchment*** Captive company or Selling Out
	Low	*7* ***Growth*** Concentric Diversification	*8* ***Growth*** Conglomerate Diversification	*9* ***Retrenchment*** Bankruptcy or Liquidation

Figure 2.1: Model of Corporate Strategies

Growth strategies involve either concentration, that is, expansion within the firm's current industry (Cells 1, 2 and 5), or diversification, where growth is generated outside the firm's current industry (Cells 7 and 8). **Stability strategies** (Cells 4 and 5) represent a firm's choice to retain its current mission and objectives without any significant change in strategic direction. **Retrenchment strategies** (Cells 3, 6 and 9) call for reduction in scope and magnitude of the firm's efforts.

Another analysis presented by Wheelen and Hunger (1995) is the organisational life cycle, which describes how organisation grow, develop, and eventually decline. The specific organisational structure is thus a secondary concern.

Figure 2.2 shows the relationship between life cycle and organisational strategies.

	Stage I	**Stage II**	**Stage III**	**Stage IV**	**Stage V**
Dominant Issue	Birth	Growth	Maturity	Decline	Death
Popular strategies	Concentration in a niche	Horizontal and vertical integration	Concentric and conglomerate diversification	Profit strategy followed by retrenchment	Liquidation or bankruptcy
Likely structure	Entrepreneur-dominated	Functional management emphasised	Decentralisation into profit or investment centres	Structural surgery	Dismemberment of structure

Figure 2.2: Life cycle versus organisational strategies

Globalisation is another important drive to organisational changes. According to Galbraith (2000), the organisational challenge to a multinational company has always been the integration of activities that take place in different countries. Additional new complexities are being generated by two changes in the business environment. One is the convergence and realignment of industries. The combination of new digital technologies, new biotechnologies, and deregulation has blurred the boundaries of many traditional industries.

The other change is the increase in foreign direct investment (FDI), which brings more complexity to the organisations, need to re-creating competitive advantages, geopolitical uncertainty, and globalisation of customers.
Internationalisation is the process of changing levels of international development, usually (but not always) to higher levels of development.

Level I – This level, export mode, uses subsidiaries as sales companies

Level II – This level occurs when a firm invests in another country and begins to conduct foreign operations but chooses a partner – usually a local company – to join in the investment.

Level III – This level occurs when the firm engages in FDI and creates multiple functions within the subsidiary.

Level IV – This level brings further complexity to the foreign-operation mode. While the typical level III is a national company with an international, or geographical, division, the level IV firm, having acquired some international capability, gives more responsibility to the subsidiaries and organises them into a multi-dimensional network.

Within level IV it may happen different distribution of power. Figure 2.3 shows two extremes, one related to the power in the geographic subsidiaries and the other extreme is the power based on the business division.

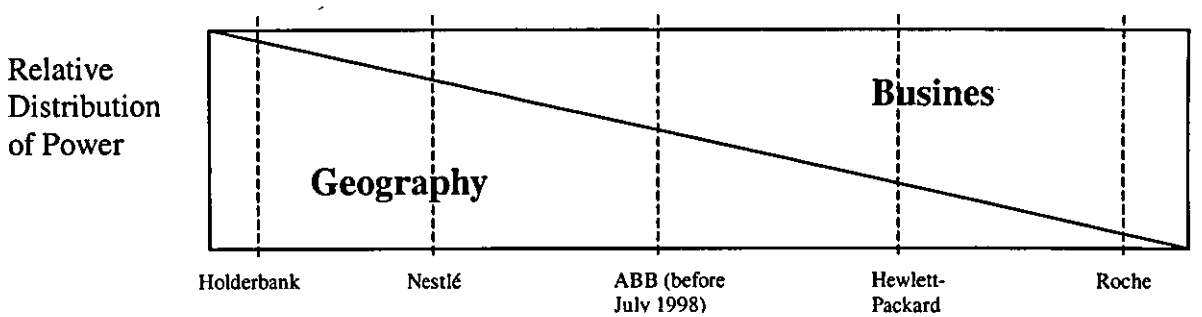


Figure 2.3: Strength of Subsidiary Links and Business Unit Power

At the left of the figure, the Holderbank building-products company, with weak links, represents the multi-domestic model, where the power and the profit and loss (P&L) are in the geographical subsidiaries; moving to the right, the links between subsidiaries get stronger, there is a more cross-border coordination, and the business units receive a more decision making power.
Most companies operate at level IV or lower.

Level V – The highest level of international development is the trans-national form, which occurs when subsidiaries assume a leadership or contributory role in developing strategies and advantages for a business. These strategies and advantages are transferred to and implemented in other subsidiaries as well as in the home country.
Galbraith (2000) also identifies a matrix organisation with division of power for geographical or for business, or a balance between both of them, as shown in figure 2.4.

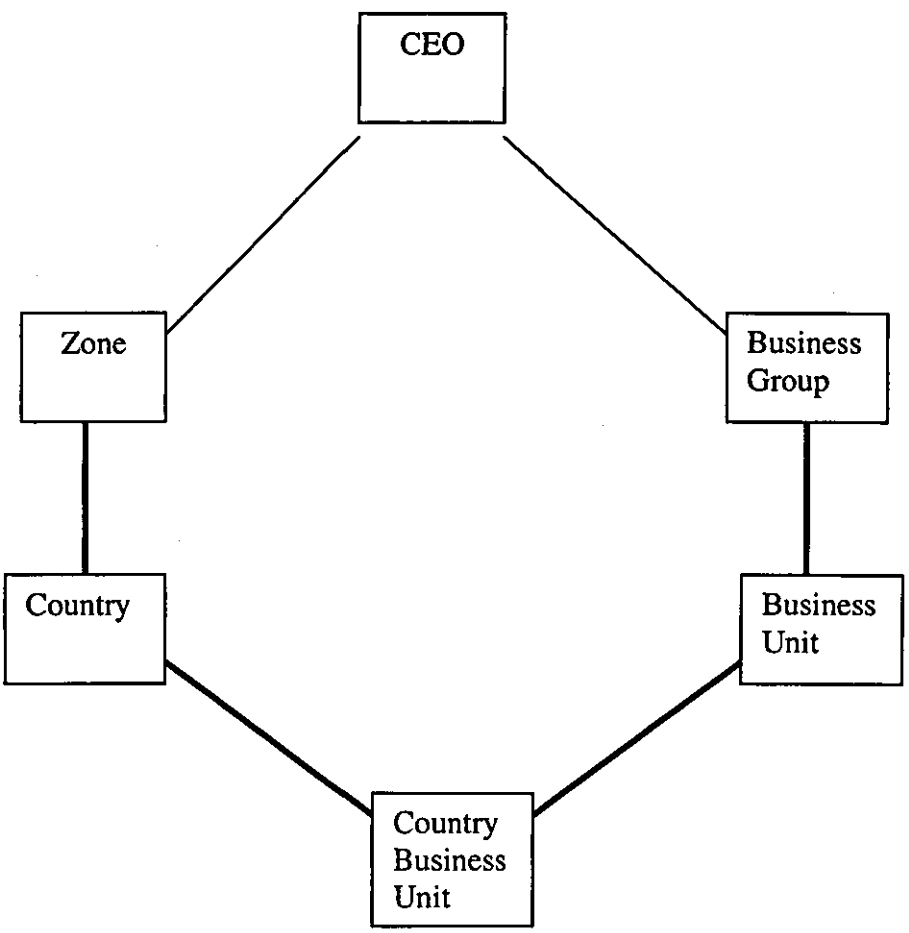


Figure 2.4 – Balanced Matrix

It can be seen, based on above discussion, that the organisational changes are very much influenced by the business macro-scenario.

According to Bierly III and Kessler (2000), individual wisdom is transformed into organizational wisdom through several means, three of the most important being:

(1) transformational leadership;

(2) organizational culture and structure; and

(3) knowledge transfer.

Additionally, wisdom must be transferred throughout the organization. This will not happen unless: the concept of organizational wisdom is understood and valued throughout the organization; and organizational leadership, culture and structure are specifically focused toward facilitating its development and transfer.

Veasey (2001) describes the use the enterprise architectures to manage strategic change. They seek to achieve this by providing a model of the enterprise that can be shared by everyone involved in managing change. Its conceptual language must be designed to reduce complexity and increase the precision with which strategy and plans can be articulated. This will reduce misunderstandings and sharpen the focus on priorities.

Architectures are also a vehicle for the hopes of those who have subjected their organisations to one management nostrum after another and are now looking for a holistic approach. They seek to restore their credibility with initiative-weary staff by offering a framework in which all the pertinent theories are positioned and the rationale for pursuing one of them at any particular time can be perceived by all. Architecture also has a role in the design and execution of strategic change programmes.

Whilst some are reengineering their processes, architects are reengineering their entire enterprises to deliver capabilities that give them sustainable competitive advantage. Architects are in control, are not deflected by fashionable buzzwords and understand the make-up of their enterprise. As a result they:

- manage change and satisfy their stakeholders;
- understand and manage key implementation issues (the soft side);
- sustain the momentum of change;
- build capabilities holistically and thus more sustainably; and
- operate an open learning environment.

2.2 Culture and Organisational Change

The word "culture" may be interpreted in several ways. It can be related to the values and tradition of a country, a continent, or a social group of people. It may also be understood as a qualification for a knowledgeable person.

However, in this thesis, the author will explore the meaning of culture within organisational aspects. Even so, the word "culture" may assume different meanings for different people.

According to Schein (1985), "culture" has many meanings and connotations. When it is combined with another commonly used word, "organisation", it is almost certain to have conceptual and semantic confusion. The term "culture" should be reserved for the deeper level of basic assumptions and beliefs that are shared by members of an organisation that operate unconsciously, and that define in a basic "take-for-granted" fashion an organisation's view of itself and its environment. Schein (1985) defines culture as follows: a pattern of basic assumptions – invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.

Mullins (1999) describes a popular and simple way of defining culture as: "how things are done around here". He also says that culture is reinforced through the system of rites and rituals, patterns of communication, the informal organisation, expected patterns of behaviour and psychological perception.

Hofstede (1994) use the word "culture" as the shared mental software of the people in an organisation. He categorises culture as follows:

- **Process oriented vs. results oriented:** It opposes a concern with means (process oriented) to a concern with goals (resulted oriented). In the process oriented culture people perceived themselves as avoiding risks and making only a limited effort in their jobs, while each day is pretty much the same. In the results-oriented cultures people perceive themselves as comfortable in unfamiliar situations and put in a maximal effort, while each day is felt to bring new challenges.

- **Employee oriented vs. job oriented:** It opposes a concern for people (employee oriented) to a concern for completing the job (job oriented). In the employees oriented cultures people feel their personal problems are being taken into account, that the organisation takes the responsibility for employees' welfare, and that important decisions tend to be made by groups or committees. In the job-oriented units people experience a strong pressure to complete the job, they perceive the organisation as only interested in the work employees do, not in their personal and family welfare; and they report that important decisions tend to be made by individuals.

- **Parochial vs. professional:** It opposes units whose employees derive their identity largely from the organisation (parochial) to units in which people identify with their type of job (professional). Members of parochial cultures feel the organisation's norms cover their behaviour at home as well as on the job. On the other hand, members of professional cultures consider their private lives their own business, they feel that the organisation hires on the basis of job competence only, and they do think far ahead.

- **Open system vs. closed system:** It shows that in the open system unit members consider both the organisation and its people open to newcomers and outsiders. In the closed system units the organisation and its people are felt to be closed and secretive, even among insiders.

- **Loose control vs. tight control:** It refers to the amount of internal structuring in the organisation. People in loose control units feel that no one thinks of costs, meeting times are only kept approximately, and jokes about the company and the jobs are frequent. People in tight control units describe their work environment as cost-conscious, meeting times are kept punctually, and jokes about the company and/or the jobs are rare.

- **Normative vs. pragmatic:** It deals with the popular notion of customer oriented. Pragmatic units are market driven: normative units perceive their task towards the outside world as the implementation of inviolable rules. In normative units the major emphasis is on correctly following organisational procedures, which are more important than results. In pragmatic units, there is a major emphasis on meeting customer needs, results are more important than correct procedures.

Hofstede (1994) revealed from a survey that manufacturing and large offices units tend to be process oriented; research/development and service units tend to be results oriented; traditional technology units tend to be parochial; high tech units tend to be professional; units delivering precision or risky products or services tend to be tight; units with innovative or unpredictable activities tend to be loose; service units and those operating in competitive markets tend to be pragmatic while units involved in the implementation of laws and those operating under a monopoly tend to be normative.

According to Schein (1985) culture operates one level below climate, values or corporate philosophy. Culture does not apply only to the human side of an organisation's functioning. Culture determines not only the ways in which the internal system of authority, communication, and work is organised and managed but also the organisation's most basic sense of mission and goal. Culture controls the manager more than the manager controls culture.

According to Long and Fahey (2000), the concept of culture is often used loosely by executives and consultants without any real attempt to define what it means in practice.

Culture is not only intangible and illusive, but it can also be observed at multiple levels in the organisation. Culture is reflected in values, norms and practices. At the deepest level, culture consists of values, which are embedded, tacit preferences about what organisation should strive to attain and how it should do it. Values are often difficult to articulate and even more difficult to change.

Drucker (1992) says that culture – no matter how defined – is singularly persistent. In fact changing behaviour works only if it is based on the existing "culture". He mentions that the reformers of India and China felt that they had to change their countries' cultures. The only results have been frustration, friction, confusion – and no changes in behaviour.

Therefore, it can be noticed that organisational change may not be achieved, in short and medium term, based on cultural change. It shall be pursued through behavioural change.

Ritchie (2000) carried out studies, which suggest that organisational culture does have a positive effect on employee attitudes. A strong culture creates a feeling of belonging and increases job satisfaction and commitment. The central focus of that research maintains that organisations can have a positive effect on the creation and internalisation of the organisational culture. According to him, management must accept the responsibility of

not only sharing the values and behaviours suggested by the culture but also embodying these same values and behaviours. Management must also believe in, and adhere to, the values and behaviours associated with the organisation's culture if it expects employees to do the same. Organisational culture can be a powerful and positive force within an organisation. Management should understand the relationship between a strong culture and organisational outcomes.

Sharkey (1999) carried out a survey, which suggests that managers' behaviour and their assumption about leadership changed while the culture did not change. According to him, while one could not document the changes in the organisation's culture one can ascertain significant changes in participant's behaviour.

On the other hand, Kolb et al. (1995) say that most change programmes do not work because they are guided by a theory of change that is fundamentally flawed. The common belief is that the place to begin is with the knowledge and attitudes of individuals. Changes in attitudes, the theory goes, lead to changes in individual behaviour. And changes in individual behaviour, repeated by many people, will result in organisational change. This theory gets the change process exactly backwards. In fact, individual behaviour is powerfully shaped by organisational roles that people play. The most effective way to change behaviour, therefore, is put people in a new organisational context, which imposes new roles, responsibilities, and relationship on them.

Kolb et al. (1995) described six steps to effective change, as follows:

- Mobilise commitment to change through joint diagnosis of business problems;
- Develop a shared vision of how to organise and manage for effectiveness;
- Foster consensus for the new vision, competence to enact it, and cohesion to move it along;
- Spread revitalisation to all departments without pushing it from the top;
- Institutionalise revitalisation through formal policies, systems and structures;
- Monitor and adjust strategies in response to problems in the revitalisation process.

Heifetz (1993) identified seven stages of the change cycle:

- **Stage one: Choosing the Target.** Most often, a change process is initiated when an individual or group feels discomfort or pressure. A target is selected and defined.
- **Stage two: Setting Goals.** Change leadership typically expands and gives greater definition to the purpose, scope, desired outcomes, and implementation plan for change effort. It must be provided enough form and substance to the objectives and means of the change project.
- **Stage Three: Initiating Action.** Extend and exercise the organisation's collective capability towards achieving your project goals. It requires an unmistakable shift from planning to action.
- **Stage four: Making Connections.** It involves achieving lasting shifts in attitude and behaviours. In order for attitudes and behaviours to truly shift, people must wrestle with the change as it plays out in their daily work. They must determin precisely which of their priorities, skills, and actions must be modified. Changes that require a shift in values, attitudes, or basic orientation require even more complex implementation processes, and these usually take much longer to accomplish.
- **Stage five: Rebalancing to Accommodate the Change.** The work of change leaders is to bring the entire work system to a new state of internal balance, where all the pieces function together as an integrated whole.. More attention may be needed to help people complete shifts in thinking, attitudes, or behaviours before a new balance can be achieved.
- **Stage six: Consolidating the Learning.** The work at this stage is not simply to reiterate what you have already accomplished. It is also time to look forward; seeds are planted for the future. New possibilities are identified that can spring to life as a new Change Cycle.
- **Stage seven: Moving to the Next Cycle.** This stage marks the point in time when one cycle reaches completion and a new cycle may begin. A momentum must exist that propels the organisation forward into the new cycle of change.

Heifetz (1993) also emphasises the role of chaos. Throughout the seven stages of the change cycle, resistance to change is encountered in many and varied forms. Resistance is a part of any organisational change effort, from inertia at the beginning of the process, to political opposition, to implementation complexities, to technological shortcomings, to entrenched attitudes and behaviour patterns, to competitive activity, to industry wide pressures, to macroeconomic factors. The force which resist change, in all it many forms, can be called chaos.

Moingeon and Edmondson (1996) analysed, for each step of organisational struggle with ambiguity, what type of knowledge was most often used.

Explicit and Collective Knowledge

Explicit and collective knowledge is the knowledge a community can explain. In an organisation, patents, written rules and procedures, organisational charts, and management decisions that are known by the whole organisation are all part of the explicit and collective body of knowledge. The purpose of making knowledge explicit and collective can be to disseminate this knowledge to others, to inform people about recent management decisions, to implement new programs and procedures within the organisation, or to signal to the "external environment" the organisational purpose and positions.

Explicit and Individual Knowledge

We can approach individual, explicit knowledge from two perspectives, the sociological and the technological. From an elementary sociological view, everything that become conscious to us, becomes part of our individual explicit knowledge. The other side of individual explicit knowledge is what we will call our "known-expertise", which does not contradict previous findings on expertise, which state the essence of expertise lies in the tacit understanding of rules that are unknown to the beginner or non-expert .

Tacit and Collective Knowledge

We all have some "truths" that we hold collective but do not state. The secret location for "D-Day" was tacitly known by thousands of people without being expressed explicitly ('tacit' being understood as 'to know more than one is willing to tell).

Tacit and Individual knowledge

First, there are many stimuli that we noticed without being aware of noticing them. We cannot communicate what we learn, thus, we are the only ones to be the receivers of this 'knowledge'. Second, we do not always learn systematically or intentionally.

Lang (2001) says that two intertwined strategic forces are compelling companies to reconsider fundamental business assumptions. These are, first, globalisation and, second, digitisation with connectivity brought about by revolutions in information processing, telecommunication (or infocom) and Internet technologies. These two forces - more aggressive global competition and accelerating technological change - translate into competition that is increasingly knowledge-based. Managers will certainly have to augment their ability to manage diversity, complexity and ambiguity in employee, supplier and customer relationships in the New Economy.

According to Lang (2001) trust and mutual dependence have developed in some chains to the point where collaborative planning means that goods are being cross-manufactured on a cue from an electronic order. By exploiting infocom and Internet technologies to enable collaboration across one's extended network of trading partners, maximum value may be delivered to customers, i.e. high quality products customized to individual needs at lower costs. Specifically, e-technologies will enable companies to integrate supply chain, compress order cycles, and improve on-line customer experience and traditional sales channel fulfilment. Flexible and open application integration will power business-to-business commerce by linking up supply chain communities to enable secure collaboration between customers, distributors, suppliers, contract manufacturers and transportation providers.

In knowledge-based hyper-competitive markets, sustainability of competitive advantage will depend on a firm's innovative capacity. The rapid creation and diffusion of knowledge within and between firms have thus become a top priority for management, because it is now recognized that knowledge is the only real source of sustainable competitive advantage. That is, a firm's performance depends on how much its managers can mobilize the knowledge resources of individuals and teams in its value chain and how well they can turn these resources into activities that lead to value creation in hyper-competitive markets.

Moingeon and Edmondson (1996) proposed the Strategic Human Resource Management process with the following hypotheses:

- Mobilising energy for change is the key to successful strategic alignment.
- Energy can be mobilised when the top team of the business unit actively engages in a process of defining strategy, and then collects and diagnoses data about barriers to enacting the strategy
- Organisation-wide commitment to change and learning can only occur when a process connects lower level organisational members and the top team in an iterative process of collecting data, diagnosing, changing and re-diagnosing. This process gives voices and empowers lower levels to help develop the organisation's capability to enact strategy.
- If strategic alignment is to occur, the business unit's top team (general managers and direct reports) must be willing to discuss its own behaviour – including the behaviour of the general manager – and must be capable of learning from the discussion. This is because strategic alignment inevitably requires new patterns of coordination throughout the organisation, and that is governed by attitudes and behaviour at the top.
- Alignment of all organisational elements (structural and behavioural) must start with a systematic vision of the organisational arrangements required to enact the strategy. Since organisational effectiveness is contingent on managing relevant interdependencies, such a vision must articulate the horizontal (across functions) and vertical (management, employees and union) coordination/cooperation requirements imposed by the strategy.
- Sustained organisational change occurs when a new organisational context is created – one that "forces" change in organisational members, but which they perceived to be owned by them, and connected to strategic purpose.

Tjosvold (1995) described the key points to create a shared vision:

Set the Stage

- Assess the business
- Reflect on the organisation
- Confront relationship issues

Challenge Status Quo

- Find adventures to enjoy
- Use frustrations
- Learn from mistakes
- Describe possibilities

Team approach

- Dialogue
- Solicit stakeholders
- Include

Ongoing

- Update
- Celebrate
- Confront complacency

Tjosvold (1995) also describes a guide to managing conflict:

Foster Cooperative Context

- Develop realistic attitudes that working together cooperatively requires conflict management
- Focus on working together to deal with the conflict
- Work for win-win solutions
- Calculate the losses of continuing the conflict and the gains of resolving it.

State and Explain Your Position

- Arrange a time and place to discuss the conflict
- Identify ideas and feelings behind positions
- Be hard on the problem, soft on the person

Question and Understand Opposition View

- Probe and ask questions
- Put yourself in the other's shoes
- Show respect and acceptance as you disagree with the opposing position
- Follow the golden rule of conflict of using the approach you want others to use

Integrate and Create Options

- Define the problem together
- Be firm in furthering mutual needs, but flexible in how to do that
- Brainstorm option
- Agree to an option
- Reaffirm the agreement

Reflect and learn

- Give each other feedback and support
- Celebrate

Pitfalls to avoid

- Seeing conflict as a problem that must be blamed on someone
- Assuming every conflict is a fight to win
- Focusing only on what you want
- Conveying it is "us versus them"
- Assuming sole responsibility to resolve the conflict
- Assuming it is sole responsibility of the other to resolve the conflict
- Repeating arguments in a louder voice
- Surprising and overwhelming
- Hitting your protagonist hard to overcome, then running to avoid getting hit back
- Returning every slight with rebuke
- Pretending to listen
- Using the other's argument only to strengthen your position
- Assuming it is "his way" or "my way"
- Using "either/or", fixed pie thinking
- Equating success with getting your way
- Gloating over your victory

According to Wagner III and Hollenbeck (1998), change is the act of varying or altering conventional ways of thinking or behaving. Whenever managers attempt to set any change in motion, they can expect resistance, because people tend to resist what they perceive as a threat to the established way of doing things. Setting changes requires identifying and overcoming sources of resistance, on the one hand, and encouraging and

strengthening sources of support, on the other. Force field analysis is a diagnostic method that diagrams the array of forces for and against a particular change in a graphic manner.

There is no universal, fail-safe way to overcome the resistant factors identified in a force field analysis. Of the many available options, the six that are used most often are the following:

- Education and communication: information about the need and rationale for a prospective change can be disseminated through one-to-one discussions, group meetings, and written memos or reports.
- Participation and involvement: those who will be affected by an intervention should be involved in its design and implementation.
- Facilitation and support: needed job training and emotional support should be provided through instructional meetings and counselling sessions for employees to be affected by a change.
- Bargaining and negotiation: resistant employees should be worked with through bargaining and the proposal of trade-offs to provide them with incentives to change their minds.
- Hidden persuasion: covert efforts at providing information should be considered for use on a selective basis to get people to support desired changes
- Explicit and implicit coercion: power and threats of negative consequences may be employed to change the minds os resistant individuals.

According to French (2001) many emotions are generated in individuals and in systems (teams, departments, organizations) whenever change "threatens". These can range from fear to envy, from rivalry to anger, from enthusiasm to cynicism, or from energetic enjoyment to apathy.

Steiner (2001) confronts individuality with conformity. Conformists don't do their own thing; they do the organisational thing. They do "what one does" in their organisation. People can operate this way because organisations sanction, encourage, reward or mandate such behaviour. They do so because this behaviour is easy to manage.

Conformists are compliant and cooperative, everyone pulls in the same direction, there is organisational peace. On the other hand day-to-day individuality involves choosing to be an individual rather than a conformist. Day-to-day individuality is not being an individual because we all are already individuals by virtue of our existential individuality, by virtue of our unique relationship with mystery, which gives us unique experiences. Rather, day-to-day or operational individuality is choosing to be an individual, recognising that one might also be a conformist but choosing the uncommon road.

But if one accepts that individuality can help people cope with organisational change, then some other academic prescriptions to facilitate managing change may need to be re-evaluated. For example, are commitment, teamwork and homogeneous organisational cultures conducive to mineness or do they encourage identification with organisational or team paradigms instead? Such paradigms change much more quickly, more often and more capriciously than academic paradigms do, contributing to the distress of anyone who cannot keep up with the pace of change.

Steiner (2001) reinforces that encouraging accommodation rather than management of change may engender organisations that are more turbulent but also more dynamic. But such organisations should also attract and hold people who can contribute to and thrive in turbulent, dynamic organisations. Such people are likely to be comfortable with change and capable of coping with it productively, so change will not be a problem that needs managing.

Bovey (2001) provides a different point of view. He mentions that a descriptive analysis of the significance of change scale showed that approximately 90 percent of respondents believed the change in their organization was affecting them at least moderately. To be specific, 2.1 percent reported that they were not affected by the change, 8.2 percent were affected by "a small amount", 20.2 percent by "a moderate amount", 32.2 percent by "a large amount", with the remaining 37.3 percent reporting being affected by "a great deal".

This research was carried out in organizations that were implementing major organizational change. Individuals were surveyed during the resistance phase of the change process in order to measure the association between an individual's irrational ideas and their behavioural intentions towards resistance.

The results of this research show that irrational ideas are associated with resistance to change. Individuals who possess higher levels of irrational ideas are more likely to resist organizational change compared to those who exhibit low levels of irrational thought. The analysis found that emotion increases the association between irrational ideas and resistance.

The irrational ideas, which were found to have the strongest correlations with resistance intentions were: blaming, being inert and passive, not controlling one's destiny, and avoiding life's difficulties.

Bovey (2001) understands the findings of this research provide further evidence for using a balanced approach to managing change. Instead of focussing primarily on technical elements, it is equally important for management to address the human elements. This study has found these human elements to include cognitive and affective processes. Management needs to implement intervention strategies and techniques that firstly create self-awareness and secondly develop processes to minimize irrational thoughts. An individual's personal growth and development is likely to alter their perceptions of change thereby reducing the level of resistance to organizational change.

Butcher (2001) emphasises the role of language is essential to our understanding of organisation, management and organisational change. He says language provides and maintains the mindsets that define the concept of organisation and there is a broader implication still for paying closer attention to language management. In the context of the issue surrounding the role of management within rapidly evolving organisational forms and protocols for business transaction, it will not be productive to maintain the "managerial-bottom-up" tension. The counterpoint role of "bottom-up", set against the hegemony of the corporate mindset, should be seen as a temporary phase. Unless management itself is eclipsed as an organisational component, then it will continue to mature into a role more consistent with the prevailing social and economic infrastructure of business and administration. The managerial mindset will dissolve - the signs are already there - only to re-emerge in a different form, one that reflects more exactly the fragmented, fluid and boundaryless nature of contemporary organisation. The centrality of language in representing organisation offers greater scope to manage the pace of this transition.

Politis (2001) emphasises that leadership style factors that are characterised by participative behaviour and mutual trust and respect for subordinates' ideas and feelings are positively related to knowledge acquisition attributes when compared with the leadership style factors that are characterised by task oriented and autocratic behaviour.

2.3 Management and Organisational Behaviour

Wagner III and Hollenbeck (1998) point out that organisational behaviour is grounded in an older tradition of research on and thinking about management in organisations:

-As early as 3000 B.C., the Sumerians formulated missions and goals for government and commercial enterprises.

-Between 3000 and 1000 B.C., the Egyptians successfully organised the efforts of thousands of workers to build the pyramids.

-Between 800 B.C. and about A.D. 300, the Romans perfected the use of hierarchical authority.

-Between A.D. 450 and the late 1400s, Venetian merchants developed commercial laws and invented double-entry bookkeeping.

-In the early 1500s, at the request of an Italian prince, Niccolo Machiavelli prepared an analysis of power that is still widely read.

-As about the same time, the Catholic Church perfected a governance structure built upon the use of standardised procedures.

-In the early 1900s, the scientific management perspective came out with Frederick W. Taylor, who developed his principles of scientific management as he rose from worker to chief engineer at the Midvale Steel Works in Philadelphia, Pennsylvania. These principles focused on increasing the efficiency of workplace by differentiating managers from non-supervisory workers and systematising the jobs of both.

-In the first half of 1900s, the administrative principles perspective were formulated by Henri Fayol. In contrast to scientific management's emphasis on reducing costs of production activities, this second perspective's focus was on increasing the efficiency of administrative procedures. Fayol, while serving as chief executive of a French mining and metallurgy firm, identified what he believed the four essential functions of management: *planning* future activities and performance objectives, *organising* the resources of the organisation to allow the pursuits of plans already done, *coordinating* the workforce in the direction of this pursuit, and *controlling* overall efforts by comparing actual outcomes with planned objectives.

-From 1930 to 1970 the Human Relations perspective was also followed. Hawthorne studies were among the earliest attempts to use scientific techniques to examine human behaviour at work. Douglas McGregor played a key role in making the human relations perspective happen, through his efforts at sharpening the philosophical contrast between the human relations approach and the scientific management and administrative principles perspectives. McGregor developed the terms theory X, for managers who try to control their employees, and theory Y, for managers who try to help employees learn how to manage themselves.

-From 1960 to present days emerged the open system perspective, where every organisation is a *system* – a unified structure of inter-related sub-systems – and it is *open*, or subject to influence of the surround environment.

According to Robbins (1993) managers are individuals who achieve goals through other people whilst organisation is a consciously coordinated social unit, composed of two or more people, that functions on a relatively continuously basis to achieve a common goal or set of goals. There are four basic management functions: planning, organising, leading and controlling.

Mintzberg (1973) identified manager's working roles, which are:

- Interpersonal:
    - Figurehead (symbolic head)
    - Leader
    - Liaison
- Informational:
    - Monitor
    - Disseminator
    - Spoke man
- Decisional
    - Entrepreneur
    - Disturbance handler
    - Resource allocator
    - Negotiator

Mullins (1999) describes that organisational behaviour is concerned with the study of the behaviour of people within an organisation setting. It involves the understanding, prediction and control of human behaviour.

Daft (2000) describes organisational behaviour as an interdisciplinary field dedicated to the study of human attitudes, behaviour, and performance in organisations.

Worrall and Cooper (1998) revealed from a research with over 1,000 managers that around 60% of managers had experienced some form of reorganisation in the last year. The majority of managers in private and public sector organisations in UK have experienced massive change in the nature of work over the last five years. These changes have been driven by increasing global competitiveness, by changes in the respective work and non-work roles of men and women, in changes in how people value their home and work commitments and by a whole raft of management fads and initiatives. All these drivers for change have had huge impacts on organisational structures, career structures and employee attitudes and behaviours. This research also revealed that the nature of organisational change was related mainly to cost reduction, for 57% of the respondents, and cultural changes, for 49% of the respondents.

Farias et al. (2000), describe that, practically all MBA programmes now include case studies dealing with the topic of managing changes, as well as issues related to organizational culture, leadership, and work motivation.

Miller (1999) observes that today's managers must learn to manage the emotional climate of their organizations with some proficiency they manage tasks and resources. Self-awareness, self-regulation, motivation, empathy, and social skills are the cornerstones of emotional intelligence.

Sharkey (1999) stated that research directly linking leadership development to cultural change has been limited. She carried out a study to isolate one specific lever for culture change – leadership development – and determine the impact it has on the culture of a division within an organization. While the culture did not change according to the survey clearly the managers' behaviour did and their assumptions about leadership did as well.

A research carried out by Ritchie (2000) in South Eastern division of one of the largest commercial banks in the United States suggests that organisational culture does have a positive effect on employee attitudes. A strong culture creates a feeling of belonging and increases job satisfaction and commitment. According to him, management must accept

the responsibility of not only sharing the values and behaviours suggested by the culture but also embodying these same values and behaviours. It is folly to expect employee's adherence to values and behaviours that are ignored by management. Management should understand the relationship between strong culture and positive organisational outcomes. Management should also understand that it possesses the opportunity to create, influence, and utilise these positive effects that can result from a strong organisational culture.

Based on the above, it seems that leadership behaviour is a critical factor to enable organisational changes, which, in turn, may lead to cultural changes in long term.

There is no single definition for management behaviour. Several authors differentiate managers from leaders, based on a set of behaviours. Others identify management behaviour in terms of pro-activity or resistance to change.

Shtogren (1999) reproduces Blake and Mouton theory describing the managerial grid, shown in figure 2.5. IT offers a schematic behavioural science framework for comparing theories of interaction between production and human relationships. The horizontal axis represents concern for production. The vertical axis indicates concern for relationship among those engaged in production.

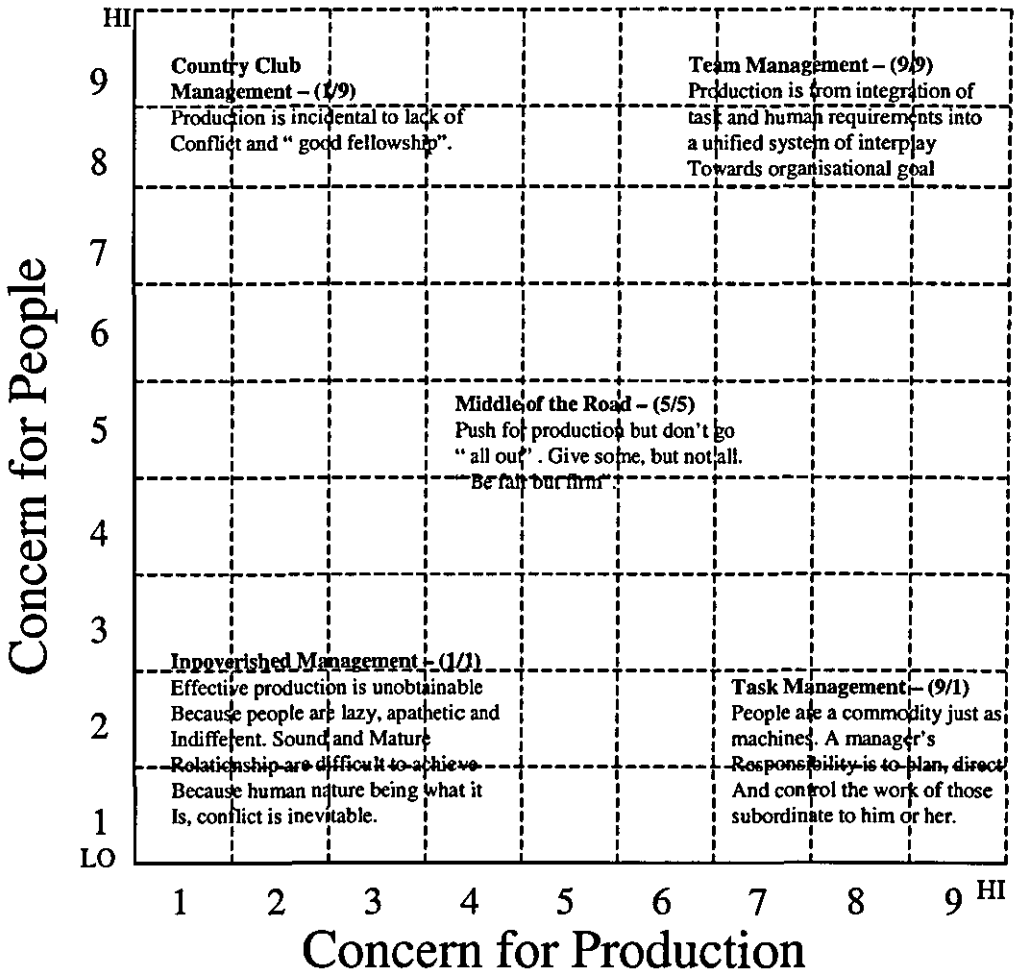


Figure 2.5 – The Managerial Grid

Kent et al. (2001) describes transformational leadership as a process by which change (transformation) is introduced to individuals and/or organizations. He identifies four main factors related to transformational leadership:

- Factor 1 is related to "individual consideration", "deployment of self", "encouraging commitment in followers", "aligning people", "enabling others to act", and "enlisting and developing stakeholders". It includes a category of behaviours that are related to creating a sense of unit, team, and/or "we-ness" and engaging that "we" in such a way as to engender commitment, stake, ownership, and empowerment.

- Factor 2 is related to "attention through vision", "sensing opportunity and formulating a vision", "establishing direction", "inspiring a shared vision", and "visioning". The items included in this factor all speak to having a sense of direction and a clear sense of the future. The items suggest behaviors involving continuously discussing the vision with others in a way that tells them that the leader has such a vision.
- Factor 3 is related to items that depict the authors' labels of "trust through positioning", "modeling the way", "building spirit and willfulness", "building trust through personal commitment", and "managing one's self". The items, at a deeper level, seem related to maintaining one's own "self", thus creating a sense of purposefulness, consistency of focus and energy, and behavior that is reflective of one's underlying intent or purpose.
- Factor 4 is related to a quality or qualities of the leader's communicating style. It includes items that reflect on the leader's ability to relate her or his ideas to others, to take the time necessary to communicate the underlying meaning and importance of the message, and to discuss the ideas at a deeper level such as at the level of values, beliefs, and principles.

Shtogren (1999) describes the main characteristics of worst managers and best managers (see table 2.1), based on a questionnaire distributed during workshops, where participants are instructed to base their profiles on real people doing real work, not on theoretical or abstract concepts.

Our Worst Managers	Our Best Managers
Focus on the short term	Share a vision of what is possible
Manage by intimidation	Lead by example
Manipulate and deceive others	Demonstrate honesty and integrity
Micromanage every detail	Trust and empower others
Take credit for what others do	Recognise and appreciate good work
Play favourites	Teach and coach everyone
Dictate all the rules	Listen with respect
React defensively to different opinions	Keep an open mind
Avoid personal risk	Create a passion for work
Show a " my way or the highway" attitude	Inspire a " we can do!" attitude

Table 2.1 – Managers' profiles

Sarros and Santora (2001) revealed that leaders who have a vision for the organization are more likely to show other leadership attributes that challenge workers to achieve beyond their expected capacities

Covey (1991) describes the principle centred leadership, a system that is represented by four fundamental dimensions: security, guidance, wisdom, and power.

Security represents our sense of worth, identity, emotional anchorage, self-esteem, and personal strength.

Guidance is the direction we receive in life. Much of it comes from the standards, principles, or criteria that govern our decision making and doing.

Wisdom suggests a sage perspective of life, a sense of balance, a keen understanding of how various parts and principles apply and relate to each other. It embraces judgement, discernment, and comprehension.

Power is the capacity to act, the strength and courage to accomplish something. It is the vital energy to make choices and decisions.

According to Covey (1991), principle-centred leadership is practiced from the inside out on four levels:

-Personal (my relationship with myself);

-Interpersonal (my relationship and interaction with others);

-Managerial (my responsibility to get a job done with others);

-Organisational (my need to organise people).

He also says that the following attitude and behaviours are essential to clearing communication lines:

-Attitudes:

- I assume good faith; I do not question your sincerity or your sanity;
- I care about our relationship and want to resolve this difference in perception. Please help me to see it from your point of view.
- I am open to influence and prepared to change.

-Behaviours:

- Listen to understand
- Speak to be understood
- Start dialogue from a common point of reference or point of agreement, and move slowly into areas of disagreement.

Sweeney and Casperson (2001) identified seven types of recognisable problem behaviours, as follows:

- A superior attitude, self-centeredness;
- Rigid and inflexible management styles;
- Poor communications skills;
- Micro-managing, unwillingness to delegate;
- Failure to develop subordinates;
- Inability to deal with an increasingly diverse and aging workforce;
- Unable to make the leap from managing subordinates to managing managers.

Gebelein (2001) says that new partnerships, strategic alliances, customer bases, market demands, distribution channels, technology, and competitive threats all demand that we anticipate change, adapt almost instantly, and manage it effectively. The best leaders do not simply respond to change but proactively recognise when change is necessary, understand the change management process, and foster an environment of agility, learning, and strategic anticipation. They prepare people to adapt readily to compete. She presents the following guidelines:

- Assess your change hardiness;
- Be prepared for resistance;
- Gain support for change;
- Involve people in decisions that affect them;
- Be clear about behavioural expectations;
- Create opportunities to practice new skills;
- Use feedback process to monitor implementation;
- Reward and reinforce both progress and success;
- Align systems to support the desired new behaviour.

Tjosvold (1995) stated that psychological research suggests the goals for the organisation, teams, and individuals should be specific enough to be measured and allow regular feedback. Recognition and rewards for reaching bottom line should be public and frequent, and they should reinforce the cooperative, mutually reinforcing goals of the groups and individuals in the organisation. Leaders need not choose between being sensitive psychologists and hard-charging, bottom-line business people. Rather considerable sensitivity and psychological sophistication are needed to create motivating bottom lines.

Respond to change

- Handle stress
- Deal with intense feelings
- Cope with burnout
- Confront distrust
- Make change a friend
- Learn to take advantage of ongoing change
- Motivate everyone to innovate

Determine Our Direction

- Help individuals find value in organisational work
- Gain employee internal commitment
- Inspire a shared vision
- Create more effective ways to serve customers
- Align the goals of individuals and groups
- Forge unity out of diversity

Getting There

- Translate intentions into effective action
- Move from alienation to trust
- Build cooperative, synergistic team organisations
- Develop mutual confidence and power
- Communicate effectively
- Debate and make business decisions
- Manage conflict
- Become self-directing
- Improve continuously

Senge et al. (1999) reinforced that most change initiatives fail. Even without knowing the statistics, most of us know firsthand that change programmes fail. The sources of problems lie in our most basic ways of thinking. If these do not change, any new "input" will end up producing the same fundamentally unproductive type of actions. To understand why sustaining significant change is so elusive, we need to think less like managers and more like biologists. All growth in nature arises out of an interplay between reinforcing growth processes and limiting processes. He suggests that leaders should specially focus on understanding the limiting processes that could slow or arrest change. According to him, the most serious change initiatives eventually come up against issues embedded in our prevailing system of management. Sustaining any profound change process requires a fundamental shift in thinking. We need to understand the nature of growth processes (forces that aid our efforts) and how to catalyse them. But we also need to understand the forces and challenges that impede progress, and to develop workable strategies for dealing with these challenges. And, it requires recognising the diverse array of people who play key roles in sustaining change – people who are "leaders". Leadership is defined by Senge et al. (1999) as the capacity of a human community to shape its future, and specifically to sustain the significant process of change required to do so.

According to Wagner III and Hollenbeck (1998), researches indicate three different decision-making styles: authoritarian, democratic, and laissez-faire. Authoritarian leaders make virtually all decisions by themselves. The democratic leader works with the group to help members come to their own decisions. The laissez-faire leaves the group alone to do whatever it wants.

Sarros and Santora (2001) proposed leadership approaches, which may provide guidelines for leadership development, theory, and practice:

- Management deals with systems and structures, leadership with people and ideas.
- People do not necessarily need management. Systems and procedures need management. People need leadership. Feelings, ideas, and teams need leadership.
- Today's business imperatives of speed and quality mean that executives must try harder and work longer hours to achieve results not merely intended to keep up with their competitors, but to blast them out of the water!

- We cannot ignore the simple practicalities of leaders needing to become more attuned to the shifts in cultural attitudes and social conscience to ensure their businesses remain relevant and competitive.
- Leadership works best when leaders and workers agree where it is they want to go and what mechanisms and strategies need to be used to get there.
- If you want to be treated as a leader and trusted by your workers, you need to model ethical and consistent work behavior that inspires trust and commitment.
- Leadership is about taking people in the desired direction by example.
- Leadership comes down to trust, respect, honesty, and integrity.
- Leadership is the personal side of management.
- Contingency leadership is often driven by the bottom line rather than the needs of society, or the values of workers.
- Transactional leadership is the transaction that occurs between leaders and followers, where followers are rewarded on the basis of their work performance.
- Transformational leadership differs from transactional leadership in that it motivates workers to perform beyond expectations.
- Successful executive leadership will need to become more cognitive and intuitive, in addition to being interpersonal and strategic.
- If you want to be treated as a leader and trusted by your workers, you need to model ethical and consistent work behaviour that inspires trust and commitment.
- Leadership success is only as good as the "what" (leadership behaviours) and "why" (personal values) of how you lead.
- Successful leaders go beyond the "how" of leadership as a mechanism, to the "what" of leadership as a process and symbiotic relationship between leader and followers.
- Successful leaders see themselves as giving more responsibility back to the workers, making them more accountable for their own successes and failures.

- Caring leadership is fine for building workplace morale and teamwork, but it may not be how you get results.
- Leadership styles respond to the organization's culture as well as the business climate generally.
- Executives feel most comfortable in coaching their people to achieve results, but see the need for direction and some autocratic behavior when the occasion demands.
- Executives who succeed in today's environment are active with their people - they inspire and reward them and correct them and if the people do not do their job, they replace them.
- Leaders inspire others to achieve through their hard work, commitment to people, and commitment to the organization.
- Leaders who are high in idealized influence also have a strong sense of emotional stability and control. These leaders rise above inner conflicts and believe strongly in their capacities to be masters of their own destinies.
- Leaders high in idealized influence are in control emotionally and believe that transforming their followers through communication, role modelling, and encouragement are appropriate strategies for achieving the mission and goals of the company.
- Inspirational leaders work actively in drawing out the best in their employees, not holding them back.
- Contingent reward leadership relies on mutual transactions among leaders and workers to achieve synergistic outcomes.
- Leaders who practise management by exception have implicit trust in their workers to finish the job to a satisfactory standard, and avoid rocking the boat.
- Leaders will need to focus more on the meaning behind the message, not just the content of the message itself.

- Driving commitment and a sense of achievement through the organization rests on technical as well as interpersonal expertise; you can't lead others without first understanding the systems in which they operate.

2.4 Business Process Re-engineering (BPR)

Hammer and Champy (1993) defined processes as a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer. They also defined re-engineering as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed.

The views of Hammer and Champy (1993) changed the way of working of many companies. They estimate that 50% to 70% of the organisations that undertake re-engineering do not achieve the results they hoped for. Bashein et al. (1994) say that some surveys show that as many as 88% of large corporations were involved in business processes re-engineering (BPR) projects. Hammer and Champy (1993) define process as "a set of activities that, taken together, produce a result of value to a customer - developing a new product, for example". They say that re-engineering cannot be carried out in small and cautious steps. It is an "all-or-nothing" proposition that produces dramatically impressive results. According to them, most companies still use the same model created 200 years ago. The division or specialisation of labour and the consequent fragmentation of its work are the main characteristics of this model. They state "renewing the competitive capability of the companies is not an issue of getting the people in these companies to work harder, but of learning to work differently". This means that companies and their employees must unlearn many of the principles and techniques that brought them success for so long. They understand that three forces are driving today's companies: customers, competition, and change. They say that "good products do not make winners; winners make good products".

They formally define Re-engineering as the "fundamental rethinking and radical redesign of business process to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed".

Davenport (1993) states that BPR cannot be carried out as a day-to-day activity. Companies treat BPR as special activities undertaken by design teams or task forces. In addition, he says that information technology (IT) can support BPR through at least the nine activities described in table 2.2 below:

Impact of IT	**Explanation**
Automation	Removal of the human work from a process
Information	Capture of the process information necessary for comprehension.
Sequencing	Changing process sequence or allowing parallelism
Follow up	Monitoring of process effectiveness
Analytic	Improving information analysis and decision making
Remote control	Co-ordination of the process from long distances
Integration	Co-ordination between tasks and process
Intellectualisation	Acquisition and distribution of intellectuals values
Simplification	Removal of process intermediaries

Table 2.2 - Impact of Information Technology on Business Process Re-engineering

Hammer and Stanton (1995) identified the ten most common ways of failing at Re-engineering, as follows:

- Don't re-engineer but say that you are.
- Don't focus on process.
- Spend a lot of time analysing the current situation.
- Proceed without strong executive leadership.
- Be timid in redesign.
- Go directly from conceptual design to implementation.
- Re-engineer slowly.
- Place some aspects of the business off-limits.
- Adopt a conventional implementation style.
- Ignore the concerns of your people.

They state that leadership and the re-engineering team is essential to re-engineer and they describe the step-by-step actions to succeed on a re-engineering implementation. Bashein et al. (1994) identified "among the biggest obstacles that re-engineering project face are:

- Lack of sustained management commitment and leadership. Management commitment must be sustained through the project. Leadership must focus on empowering employees, because they, ultimately, are the source of dramatic improvements.
- Unrealistic scope and expectations. Misconceptions and misunderstandings about BPR are allegedly common. Seniors executives' expectations may not be realistic. They may want concrete evidence of success within a few months, for example, when the design and implementation of a project may take 18 to 24 months.
- Resistance to change. BPR is said to cause great resistance everywhere in the organisation. Most resistance is reported to come from middle managers, because major layoffs are occurring in middle management ranks".

From the research with external re-engineering consultants, Bashein et al. (1994) concluded that the positive preconditions for BPR are:

- Senior management commitment and sponsorship;
- realistic expectations;
- empowered and collaborative workers;
- strategic context of growth and expansion;
- shared vision;
- sound management processes;
- appropriate people participating full-time;
- sufficient budget.

Negative Preconditions Relating to BPR:

- The wrong sponsor (e.g., someone too technically focused, too low in the management rank, etc.);
- A "do it to me" attitude (executives that want to re-engineer without getting involved and without committing the company's best human resource to the project);
- Cost-cutting focus;
- Narrow technical focus;
- Unsound financial condition;
- Too many improvement projects under way;
- Fear and lack of optimism;
- Animosity towards and by human resources specialists.
- Consensus management;

Hammer and Stanton (1995) classified "ignore the concerns of your people" as a common way of failing at re-engineering (see page 2-2) while Bashein at al. (1994) classified "consensus management" as a negative precondition related to BPR. Although these statements seem to be similar (which would be conflictive statements), the author understands they are quite different. To listen to the concerns does not mean that one will decide only when a consensus is achieved.

They also provide recommendation how to create positive preconditions if they don't exist and also how to turn around negative conditions.

Klein (1994) identifies six categories of BPR tools, as follows:

- Project Management
- Co-ordination
- Modelling
- Business Process Analysis
- Human Resources Analysis and Design
- Systems Development

Hammer (1996) stated: "the radical character of re-engineering, however important and exciting, is not its most significant aspect". He adds that "for a world of process-centred organisations everything must be rethought: the kind of work that people do, the jobs they hold, the skills they need, the ways in which their performance is measured and rewarded, the careers they follow, the roles managers play, the principles of strategy that enterprises follow".

Mashari et al.(2001) points out important elements associated with the BPR implementation process, which adopts a holistic approach:

Establishing a sound case for change through a comprehensive realisation of internal and external threats and opportunities, benchmarking internal and external practices, identifying the business visions in the targeted areas, and consolidating all that in a well-planned strategy is commonly ascertained by both quantitative and qualitative findings.

Facilitate the establishment of a "sound knowledge base" through developing a culture based on "knowledge creation" and sharing, where success is awarded/rewarded and yet, failure not stigmatised.

Taking an integrative approach to BPR implementation through combining different change efforts in one strategic improvement programme is another important element of the holistic BPR. This involves determining improvement areas and developing synchronised strategies to achieve them at different levels and scopes.

Making use of sound methodologies, tools and techniques ensures a systematic and a well-disciplined process of BPR implementation.

Assess the "fit" between the most appropriate BPR implementation path and the organisations commitment to change and learning.

Making use of IT enablers and support for both analysing and modelling processes, as well as to support the new process configuration. In doing so, assessing the human and organisational impact of new technology.

Change management that includes cultural and structural changes is also asserted by both sets of findings as a core element of BPR implementation. Support and commitment from top management are also an important facilitating factor.

A variety of socio-technical factors often prevent management from embarking on process improvement initiatives together with a misunderstanding of what type of change may be required (continuous change of major step-change).

Kent et al. (2001) suggests that if BPR is to be applied successfully, either its usage needs to be restricted to change situations where process dominates, or a holistic approach is needed to help address adequately change situations where different types of organisational change are surfaced.

This gives rise to a key problem for BPR implementation. Organisational change, it may be argued, cannot be reduced to change in process, structure, culture, or politics.

Kent et al. (2001), based on a holistic perspective, critiques BPR as an approach to the management of change, in which four different types of organisational change are identified: changes in process, structure, culture or politics. They are seen to be inter-related, rather than isolated. The main implications are as follows. First, different approaches to change are needed to address different types of organisational change. Second, since different types of organisational change are interrelated, how to manage this interaction is central if organisational change is to be successful. Consequently, these require that any method or methodology used must be able to address the multiple facets. However, BPR, as an approach to change management, has been seen to focus almost entirely on processual change, lacking the capacity to deal with other dimensions.

Paper et al. (2001) describes lessons learned in a case study company (Honeywell):

Lesson one: people are the key enablers of change

Business processes are complex, but process mapping offers a comprehensive blueprint of the existing state. The blueprint enables systematic identification of opportunities for improvement. IT is complex, but vendors, consultants, and system designers can create models of the system. In contrast, people are unpredictable. They cannot be modeled or categorized universally. However, people do the work and therefore must be trained, facilitated, and nurtured.

Lesson two: question everything

Allowing people to question the way things are done is imperative to change. Fail-safing provides a systematic approach to effectively question the status quo. People are encouraged to question the existing state.

Lesson three: people need a systematic methodology to map processes

Process mapping is the mechanism used to map and understand complex business processes. The systematic nature of the process mapping methodology keeps people focused and acts as a rallying point. Moreover, process mapping provides a common language for everyone involved in the project.

Lesson four: create team ownership and a culture of dissatisfaction

Once a team perceives that they "own" a project, they tend to want to make it work. It becomes "their" project. In addition, management should encourage people to be dissatisfied with the way things are currently done. However, punishing people for complaining about ineffective work processes is an effective way to promote the status quo.

Lesson five: management attitude and behavior can squash projects

If the managerial attitude remains that of "command and control" and/or their behavior does not change, transformation will most likely fail. Success depends on facilitative management and visible and continuous support from the top. When Honeywell got its new president in 1996, the attitude toward criticism changed dramatically. The new president was not as accepting of casual criticism. Criticism of the status quo had to be based on well-thought-out ideas and presented with the logic behind their thinking. This drastically reduced the complaints about existing processes without justification.

Lesson six: bottom-up or empowered implementation

While support from the top is critical, actual implementation should be carried out from the bottom-up. The idea of empowerment is to push decisions down to where the work is actually done. Process mapping and fail-safing are two systematic and proven methodologies that help support empowered teams.

Lesson seven: BPR must be business-driven and continuous

Process improvements should be aligned with business objectives. Process mapping, fail-safing, and teaming should be based on what the business needs to change to become more successful. In this case, effective communication of ideas from top management throughout the enterprise is imperative. In addition, organizations should be wary of the "I've arrived" syndrome. Change is continuous and is never over.

Lesson eight: IT is a necessary, but not a sufficient, enabler

IT is not a panacea. IT enables BPR by automating redesigned processes. However, information is for people. People work with people to produce products for other people. In addition, people need quick and easy access to quality information to help them make good decisions. Therefore, IT needs to be designed to support the business and the production of products to be effective.

Lesson nine: set stretch goals

Goals should be set a little higher than what the team believes they can accomplish. Since teams have little experience with the new paradigm, goal setting will tend to be based on the past. Project managers should work with the team to help them develop stretch goals.

Lesson ten: execution is the real difference between success and failure

The Honeywell case introduces four powerful mechanisms to facilitate enterprise change. However, real change will not happen without a plan for change and aggressive execution of that plan. We believe this is where most organizations fail. We believe that execution fails in many cases because organizations are not willing to dedicate resources, time, and energy to the effort.

Marjanovic (2000) advocates that despite more and more innovative technological solutions for business processes, resistance to change continues to be the biggest BPR obstacle.

It has been widely recognised that organisational and human, not technical barriers present the major challenges in BPR.

To fully understand the human side of BPR and to reduce resistance to change, the following strategies should be implemented.

Employees' attitudes towards the reengineering should be identified and reasons for resistance should be assessed

At the beginning and during a reengineering project, it is necessary to identify and evaluate employees' attitudes towards the reengineering (e.g. favourable, neutral, unfavourable). When a group of change-resistant employees is identified, the next step for managers is to understand the reasons for their resistance. For example, the reason could be old habits that are very difficult to change.

Also, if people feel they have no control over change or if they do not adequately participate in the reengineering process, they are likely to resist the change. Additionally, some people may be tired of constant changes and they may feel "too tired" to learn new skills and change once again. Furthermore, changes usually create the feeling of insecurity.

The threatening nature of BPR should be recognised

This comes as no surprise, because very often it results in termination of employment. To reduce the level of anxiety and overall feeling of insecurity, managers should encourage employees to openly discuss their fears and problems. Open communication is the critical factor, though not easily achievable.

Employees should understand the need for change

It is important that employees understand the need for change and expected benefits of BPR. If employees receive the full facts and have any misunderstanding clarified, they are more likely to support the change. Hence, imposing formal changes too soon without understanding, will be demotivating and will increase resistance.

Employee participation in the reengineering process is crucial

Business processes being reengineered are performed by employees. They are the people who best understand the problems of the existing processes and may have some suggestions for their improvement. Therefore, employees' participation in the reengineering process is very important. Furthermore, their involvement is likely to reduce their resistance to change.

Communications should be improved at all organisational levels

Regular communication must be established between executives and those who will be affected by the reengineering process. Communication, to the organisation as a whole, should start well before reengineering and its implementation start. All sensitive issues must be addressed honestly and openly.

In summary, it is clear that managers should resolve any points of conflict and distrust with employees who are affected by BPR. Managers should not proceed with reengineering until all potential problems are resolved. Open communication must be encouraged

2.5 New product Development Process

Considering that the thesis investigation is related to the new product development process, it is worth reviewing its evolutionary remarks.

In prehistoric times mankind designed artefacts that helped them to survive in a very hostile environment. There was no marketing need, but just their own need. They probably designed and manufactured their instruments by observing nature and the animals. In addition, they utilised everything they produced for self-defence and survival. Therefore, inventions were extensions of their own body. Hence, primitive men were customers to themselves, designers, process engineers, manufacturers, etc.; thus, they were unconcerned about other people's needs.

In the middle ages, commerce had already been established and subsequently man started exchanging goods for coins. As a consequence, in order to earn some money, they started to produce goods to sell to other people. They started to assess other people's needs in order to produce goods that were looked for by others. Such a strategy helped to develop the sense of belonging to a society. At that time man knew the market needs were, he designed and manufactured by himself, and delivered the product to his customers. Therefore, he owned the entire product development cycle.

According to Cross (1989), in traditional, "craft-based societies 'designing' is not really separate from 'making'...In modern, industrial societies, however, the activities of designing and of making artefacts are usually quite separate".

It can be concluded that the industrial revolution has separated 'designing' from 'making' in order to augment production rate.

Hammer and Champy (1993) state that most modern companies base their product development strategies on the fragmentation of each manufacturing process to allow a higher production rate. According to him, "some number of specialised workers, each performing a single step in the manufacture of a pin, could make far more pins in a day than the same number of generalists, each engaged in making whole pins".

Instead of improving the job of one artisan, a new radical way of working was created. The main objective was to increase wealth and not to improve the well-being of society or humankind.

Following that philosophy, companies have developed functional organisations and consequent product development cycle fragmentation. The ever growing market needs for manufactured goods boosted industry since the industrial revolution. However the 1990's period brought strong market globalisation, which in turn, changed demands for products. Customers are able to compare different products with the same function, and can frequently state their needs. Clearly, these factors make customers more selective than in the past.

Due to market transformation, companies had to change drastically to a more customer-oriented approach. However, once a strong industry and market had been created it became imperative to use modern technology to translate customer's requirements into product characteristics. As a consequence, companies were made to examine the way that they manage the product development cycle.

Miller (1993) states that "every manufacturing organisation making more complex products now must:

- Constantly reduce product costs;
- Substantially shorten time to market and competitive response time, and;
- Constantly improve product quality".

To face this challenge and also to satisfy customer needs, it was necessary to review the product design processes, and try to minimise the consequences of the fragmentation practised during the last two centuries. As a result, new design patterns have emerged during the last decade, such as Concurrent Engineering, Integrated Product Development, Business Process Re-engineering, Total Quality Management, just to name a few.

All of these are concerned with people organisation and behaviour in the productive and market chain. Because these approaches propose a new way of doing business, the main results of improvement for industry and the market will come from people behaviour progress rather than technology or product design philosophies.

According to Cooper (1993), an estimated 46percent of the resources that firms spend on the conception, development, and launch of new products are spent on products that either fail commercially in the marketplace, or never make it to market. And for every four projects that enter development, only one becomes a commercial success. A management survey has revealed a number of failure reasons:

- Poor marketing research
- Technical problems
- Bad timing

Crawford (1997) suggests various attitudes, training, and experience guidelines for people who would like to become managers in the new products process:

- Be multi-functional
- Be risk takers
- Be general managers types
- Be a combination of optimist and realist, aggressor and team player, leader and follower
- Have a strong creative bent to achieve better product characteristics
- Be comfortable in environments where chaos and confusion seem to reign

2.5.1 Concurrent Engineering:

Kruglianskas (1995) states that the term Concurrent Engineering was first used in 1986, when utilised in a report of the Institute for Defence Analysis (IDA).

Miller (1993) defines Concurrent Engineering Design (CE Design) as a term formally describing " a set of technical, business, manufacturing planning, and design processes that are concurrently performed by elements of the manufacturing organisation prior to the commitment to actually produce something. The CE design process, in its simplest form, is the integrated execution of four business/technical processes at the same time. These are Process Management, Design, Manufacture, and Automated Infrastructure Support".

According to Michelletti (1994) CE is a "strategic concept, leading to the systematic approach of the integration of design, production and related processes dealing with all aspects of the product life cycle (included manufacturability, assemblability and repairability considered at the earlier phases of the design process)".

Parsaei and Sullivan (1993) say that there are two basic approaches to implementing concurrent engineering practice: team-based and computer-based approaches. While the multi-functional approach allows people from different areas to work together, computer technologies have given team members the ability to work in real time on the same design and to interact easily among them. They understand that "a significant educational programme is a must to have each team member to fully understand the philosophy of CE".

Based on the experience of DORNIER aeronautical company with developing complex products, Stockburger (1993) emphasises that by using concurrent engineering, a product can achieve its targets concerning quality, time to market and cost. The concurrent engineering concepts proposed by DORNIER are listed below:

Concurrent Engineering Concepts:

- Integrated teams
- Phase management
- The management control loop with extensive planning
- Use of analytical optimisation as far as possible instead of broad band testing
- A far sighted technology development, and
- To avoid over engineering

Barclay and Poolton (1994) postulated that CE has four generic components, which are:

- A purpose: there must be a reason for using and introducing CE.
- A process: the actual integrated product development process, especially information capture, transfer and translation.
- Technology aspects: tools, techniques and the product itself.
- Human aspects: the people, organisation and culture involved in the process.

CE is concerned with the concurrence of the product development process in replacement of a sequential process approach. From the beginning of the design process until the manufacturing of a part, a multi-functional team allows complementary knowledge to be brought into design solutions and consequently to achieve a better product.

Stevenson et al. (1994) reported in the results of "the Best Manufacturing Practices Programme" (BPM) carried out with U.S. Navy contractors that 58% of the surveyed companies were using teamwork practice while 52% of those companies were using Concurrent engineering practices. This is consistent with results found by Wright et al. (1995) in a survey with UK companies where approximately 60% of surveyed companies declared that they were adopting Cross Functional Teams and Concurrent Engineering approaches.

A survey undertaken in Brazil by Kruglianskas in 1993 revealed that companies producing automotive parts frequently commenced using CE without having a previous theoretical knowledge about this subject.

Johne and Snelson (1990) credit the success of a product to the execution of the design approach. It was observed that a multi-functional team may allow specialists to work together purposefully in the same direction.

2.5.2 Integrated Product Development

Definition:

Integrated Product Development (IPD) is a broader philosophy than Concurrent Engineering. CE deals mainly with a concurrent process and associated planning and teamwork. IPD goes beyond these aspects and also considers company organisational structure, software and hardware environment, and strategic upper management commitment to guarantee that the company, as a whole, will be integrated to achieve the best results from the product development process.

According to Andreasen and Hein (1987) IPD is "an approach to product development whose aim is to create the proper interactions between the separate activities within the company. The IPD is defined as being an idealised model for product development, which clarifies integration between project and management, including the need for continuous product planning".

Hunt (1993) links several concepts (Customer Satisfaction, Process Understanding, Re-engineering, Quality Goals, Adoption of Multi-functional Teams, Tools and Techniques, and Continual Improvement of the Process) under the IPD philosophy.

McGrath et al., (1992) developed a product design method called Product and Cycle Time Excellence (PACE) which can be understood as an Integrated Product Development approach.

Shaw et al. (1993) describes how the Lockheed Missiles & Space Company has been moving from a traditional organisation to an IPD oriented approach. The cultural change is an issue that is being carefully addressed since the complexity of products they design and manufacture, associated with traditional customers that were technology driven, has led to a strong functional organisation. Shaw summarises the differences between traditional and integrated product development as shown in table 2.3.

Traditional	**IPD**
Functional Organisation	Product Centre Organisation
Task Focus	Product Focus
Individual	Team
Hierarchical	Empowerment
Specialist	Generalist
Divided	Overlapping
Sequential	Concurrent
Functional	Multidisciplinary
Analytical	Synergistic
Top-down	Non-traditional

Table 2.3 - Differences between Traditional and IPD oriented organisations

Lessons learned by Lockheed Martin and reported by Shaw are summarised based on the following topics:

- Have a vision: work against a concept.
- Pilot Programmes: gain experience before spreading a new philosophy into the company.
- Limited deployment: optimise the return by choosing areas of maximum benefit.
- Training: give involved people the opportunity to learn crucial skills to work in the new environment
- Organisational Strategies: keep teams intact, as much as possible.
- Transitional Support: use integration teams.

It is important to point out that the proposed product development strategy is based on a Core Team approach, described by McGrath et al (1992), undertaking activities based on simultaneous processes. The product development phases are sequential and the budget associated with each phase will only be approved if the company has succeeded in the previous phase.

The overall product development strategy will also be achieved by taking into account the company internal culture so as to find out the best compromise between an idealisation and the day-to-day activities.

Even when a company agrees to adopt a theoretical model for product development, it will be adapted to each company's internal project since such projects will probably have different characteristics.

Paashuis (1998) analyses the organisation of integrated product development and states that management plays an important role in directing people of different functions towards integrating their activities and empowering them to do so. Typically in situations where functions area carrying out their activities in a sequential way, management is asked at certain points in the New Product Development Process to approve decisions that have to be made. In Integrated Product Development, such decisions have to be made more frequently due to the higher rate of interaction between functions. Significant time saving might be realised because decisions are made on the levels at which issues occur, eliminating the need to refer them to higher levels.

Too much interference by senior managers might slow down the development process. Management also plays an important role in sustaining integration efforts. It is their task to monitor the degree to which integration is achieved in all New Product Development projects, because integration might have been achieved in one part (part of a) project but not in another. The roles, responsibilities and authorities of stakeholders need to be clearly defined. This is particularly true of procedures concerning integration because Integrated Product Development often departs from the traditional ways of working of functions and hierarchical levels. Paashuis (1998) reinforces that the implementation of Integrated Product Development often requires people to change their ways of working.

2.6 The Organisational Management trends

Several authors report problems with company managers adopting philosophies on the basis of fashion.

Drucker (1994) calls attention to the number of management techniques in today's environment: "down-sizing, outsourcing, total quality management, economic value analysis, benchmarking, re-engineering, etc.". Each one is a powerful tool. He states that these tools do not bring radical change to what is being done. They are "how to do" tools rather than "what to do". He concludes that the root cause of today's problems is that "assumptions on which organisations have been built and on which they are running no longer fit reality".

According to him, the specification of a valid theory of the business must be as shown below:

- The assumptions about environment, mission, and core competence must fit reality;
- the assumptions in all three areas have to fit one another;
- the theory of the business must be known and understood throughout the organisation;
- the theory of the business must be tested constantly.

"There is a need for preventive care - that is, for building into the organisation systematic monitoring and testing of its theory of the business. There is a need for early diagnosis. Finally, there is a need to rethink a theory that is stagnating and to take effective action in order to change policies and practices, bringing the organisation's

behaviour in line with the new realities of its environment, with the new definition of its mission, and with new core competencies to be developed and acquired".

From the above, we can conclude how important it is to have a flexible organisation in terms of cultural change. From the president to the shop floor employee, all company employees must be prepared to modify their way of working at anytime. This is what will make the company flexible enough to respond rapidly to changes in the market, technology, or commercial factors.

Champy (1995) states that modern managers must focus their attention on four basic questions, as follows:

- "What is this business for?
- What kind of culture do we want?
- How do we do our work?
- What kind of people do we want to work with?"

According to him, the reality of the new marketplace obliges managers to ask themselves, continuously, whether what they are doing is worth doing, or whether they should be doing something else. Managers must be absolutely clear about their business purposes and ensure that their employees know them.

To accomplish this managers must first change their ways of thinking; otherwise they will not communicate, as they should.
Champy (1995) researched hundreds of corporations that undertook re-engineering projects, and concluded that there is willingness to:

- Always perform up to the highest measure of competence;
- take initiatives and risks;
- adapt to change;
- make decisions;
- work co-operatively as a team;
- be open, especially with information, knowledge, and news of forthcoming or actual "problems";
- trust and to be trustworthy;

- respect others (customers, suppliers, and colleagues) and oneself;
- answer for our actions, to accept responsibility;
- judge and be judged, reward and be rewarded, on the basis of our performance.

According to Champy (1995), management processes should be re-engineered as has been done to work process. He identifies five core management processes: *mobilising, enabling, defining, measuring, and communicating.* He concludes that ***"today, it is not what you know that counts, it is what kind of person you are.***

In today's environment, where concepts are changing quickly, and there is company pressure on its employees to comply with global market demands, it is imperative to prepare people to face such challenges which in turn will affect their behaviour towards meeting what is expected from them.

The staffs that will be affected the most are the middle managers. They are the company change enablers and have been under pressure due to the need for a flatter organisation. As a consequence, their role has been changing significantly.

According to Jackson and Humble (1994), the management command and control approach becomes obsolete. " In this new organisation, middle managers are enablers, trainers, coaches - true leaders. They use their experience and skills to bring the best out of others". According to him, factors like Information Technology revolution, creativity and values directly affect the role of middle managers. Figure 2.6 summarises all factors that, simultaneously, must be assessed to create high-performing managers. The monitoring of such factors is very valuable for any manager to improve his contribution to the organisation, mainly if a strong cultural transformation is taking place.

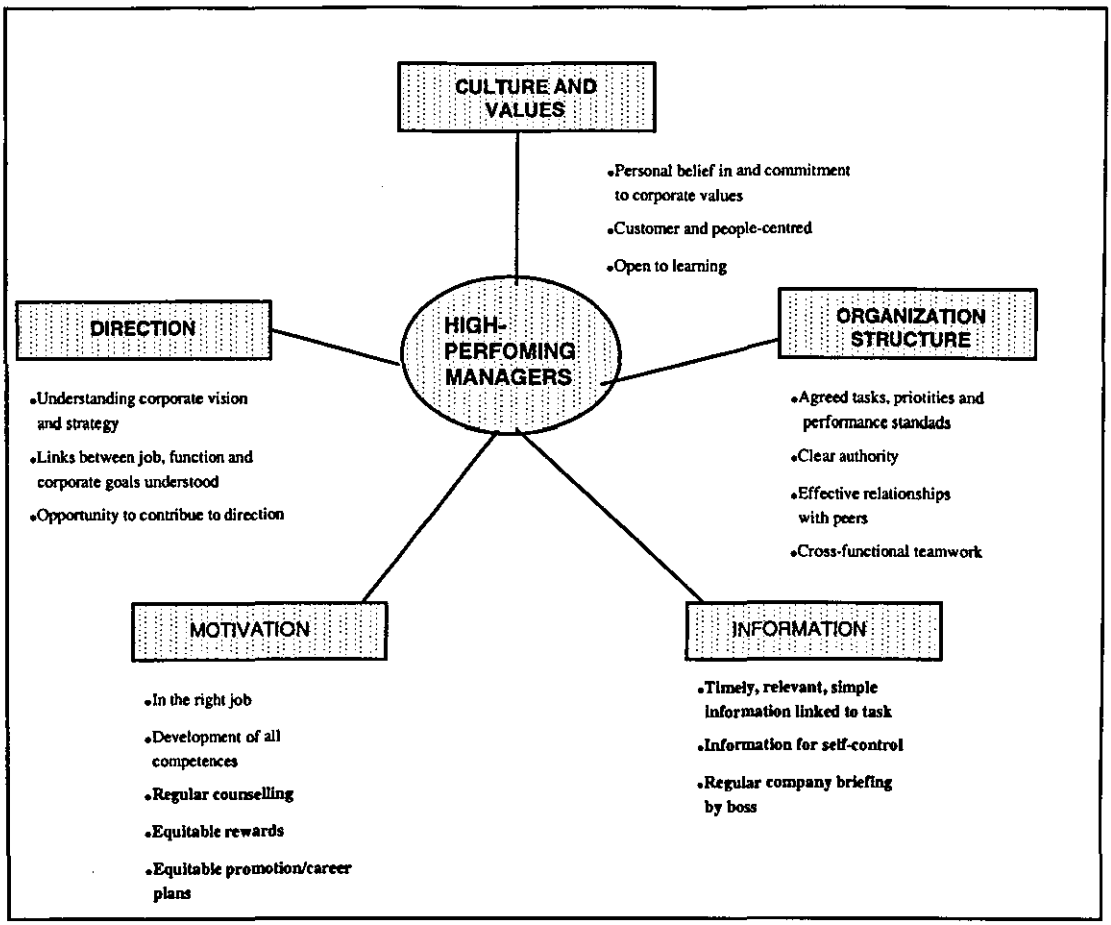


Figure 2.6 - Developing Middle Managers

Jackson and Humble (1994) conclude that middle managers will continue to play a vital role in an organisation even considering that the number of middle managers tends to diminish within an organisation. "Instead of being channels of communication and control, they will become conduits of changes and challenge. They will remain because their new role as coaches, change agents and entrepreneurs rather than bureaucrat, are essential to the organisation they serve. They will translate directions into strategies and values into behaviours. They will be coaches and motivators not controllers and directors. It is time for top managers to recognise, nurture and respect this untapped source of loyalty, experience and wisdom rather than write it off as the fossilised layer of the organisation".

Lutz (1994) describes the Chrysler approach towards a team-based work and for selecting general managers. He stated: "We look for people with good technical skills to be general managers, although they don't have to be specialists in combustion processes or anything like that. They do, however, have to be very goal-oriented, be very active, have good inter-personal skills, and be capable of motivating and building teams. We do not want the "Bull of the Woods" kind of people who rule by intimidation; we want people who manage the new way - by teaching and coaching (but not abdicating). And they have to have a strong desire to get the job done".

McClelland (1994) observed that a more strategic role should be to give credit to managers. Besides that, management process should be part of company strategy towards competition. He states that "the design and implementation of a successful Strategic Management Development Programme requires not only a fundamental change in the perception of what management development is designed to do but also requires a re-thinking and re-examination of the strategic value and role that management development plays on an organisation-wide level".

Senge (1990) believes that five new "component technologies" are gradually converging to innovative learning organisations. These technologies are:

- "Systems thinking: a conceptual framework, a body of knowledge and tools that has been developed over the past fifty years, to make the full patterns clearer, and to help us see how to change them effectively.
- Personal Mastery: a professional level of proficiency, defined as the discipline of continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of seeing reality objectively.
- Mental Models: deeply ingrained assumptions, generalisations, or even pictures or images that influence how we understand the world and how we take actions.
- Building Shared Vision: a discipline for translating individual vision into shared vision. It involves the skills of unearthing shared "pictures of the future" that foster genuine commitment and enrolment rather than compliance.
- Team Learning: starts with "dialogue", the capacity of members of a team to suspend assumptions and enter into a genuine "thinking together". When teams are truly learning, not only are they producing extraordinary results but the individual members are growing more rapidly than could have occurred otherwise".

Senge calls systems thinking the Fifth Discipline because it is the discipline that integrates the other four disciplines, focusing them into a coherent body of theory and practice.

The market globalisation associated with new management and product development approaches has demanded deep changes in company organisational structure.

According to Biemans (1996), such new organisational structures are:

- "Flat - through the elimination of many middle management layers,
- Flexible - because of geographically dispersed local operations, and
- Customer responsive - by giving front-office employees the required resources and decision-making authority".

The functional organisation reflects the fragmented working philosophy stated by Adam Smith. As a consequence, in this type of organisational structure each manager seeks local optimisation rather than for a company integrated and holistic optimisation.

According to Wagner III and Hollenbeck (1998), functional structure is a form of bureaucratic structure adopted by organisations that are larger than 50 or so members that can be coordinate by means of a simple differentiated structure. First, functional structures are based on coordination by *standardisation.* Second, these structures are organised according to *functional departments.* Third, functional structures are *centralised.* The primary strength of the functional structure is its economic efficiency.

The divisional structure, according to Wagner III and Hollenbeck (1998), are also bureaucratic, and as such, it is characterised by standardisation, formalisation, and specialisation. Unlike functional structures, however, divisional structures are moderately *de-centralised.*

Matrix structures, like divisional structures, are bureaucratic structures adopted by organisations that must integrate work activities having to do with a variety of products, locations, or customers.

Wagner III and Hollenbeck (1998) consider that many organisations have grown extremely large, employing hundreds of thousands of individuals, producing tremendous variety of goods and services, and doing business in every corner of the world. At the same time, these firms have found necessary to be more flexible then would be allowed by even the most flexible form of bureaucracy.

As a result, managers have begun to experiment with new kinds of post-bureaucratic structures. One form of post-bureaucratic structure, the multiunit structure, achieves high flexibility by de-integrating divisions of a large organisation rather than by integrating divisional elements along functional lines, as is done in a matrix structure. A multiunit structure emerges when the divisions of a divisional structure are permitted to separate themselves from the rest of the organisation and develop into autonomous, self-managed business units. On the cutting edge of \structural experimentation is a second type of post-bureaucratic structure, the virtual structure. It is a form of structure in which several organisations attain the performance capabilities of a single, much larger firm while retaining extreme flexibility and significant efficiency. In virtual structures, each firm focuses on doing the thing it does best – using core competency in design, manufacturing, marketing, or any other necessary function – and, together, all the firms form a "best of everything" organisation. The temporary nature of the virtual structure is the source of its flexibility, because companies can be added or subtracted as the situation warrants.

McGrath et al. (1992) describes the characteristics and disadvantages of traditional organisational structures, as follows:

The functional approach:

- Contributes to the product development process in a serial, or hand-off, fashion;
- Tends to foster a "throw-it-over-the wall" attitude;
- Creates a cumbersome system of sign-off and approval;
- Has many vertical layers and generally lacks the horizontal network necessary for effective communication, co-ordination and rapid decision-making.

The matrix management attempts to break down functional walls. The basic philosophy underlying matrix management has people within a given function "loaned out" on a full time or part time basis to work on a specific project. The matrix model attempts to take the best from functional organisation and combine it with a temporary project focus.

The matrix management approach:

- Requires a significant amount of executive time;
- Leads to constant conflicts about individual's responsibilities;
- Results in confrontation between functional managers and project managers.

Mullins (1999) defines matrix organisation as a combination of:

- Functional departments which provide a stable base for specialised activities and a permanent location for members of staff; and
- Units that integrate various activities of different functional departments on a project team, product, programme, geographical or system basis.

Mullins (1999) says that the matrix organisation therefore establishes a grid, or matrix, with a two-way flow of authority and responsibility.
According to McGrath et al. (1992) the core team approach tries to overcome the above disadvantages. The core team generally consists of five to eight individuals with different skills and a core team leader. It does not use the classical hierarchical approach to organisation. Individual team members focus less on representing a functional area and more on carrying out the tasks that contribute to the ultimate success of the project. Core team members execute their responsibilities directly, on their own, by supervising people assigned to them and by coordinating with functional specialists.

Biemans (1996) understands that organisational networks are the most adequate approach to cope with new marketplace demands. In addition, the role of information technology is fundamental to support organisational networks.

The way to organise people will reflect a company's philosophy towards product development. However, people must be well informed about the company's vision, objectives and goals and each individual must find his own vision for motivation and integration with the proposed working philosophy.

2.7 Teamwork as the basic building blocks

As the basis of BPR and new complex product development lies in the power of a teamwork approach, it is essential to understand how to prepare high performance teams.

Tagiuri (1995) reported the results of a survey involving the participants of the 1993 Annual Seminar for Managers of Industrial Research. They found the following concepts to be the most important:

- Team mission, objective;
- Composition;
- Leadership;
- Support by higher management;
- Resources;
- Training;
- Rules of procedure and conduct;
- Recognition.

Tippett and Peters (1995) carried out a survey on team building and project management with 88 companies from the USA (half of them located in Huntsville, Alabama) based on Robert P. Hagen's six key elements of most successful team-building plans (see table 2.4).

1. **In all actions, demonstrate respect and consideration for all employees as valued members of the team.** Are employees encouraged by example and admonition to respect each other? Do they know enough about each other's job to appreciate the contributions others are making? Does a general atmosphere of consideration exist?

2. **Identify individual job responsibilities and performance standards and see that they are known.** Are individual discussions held to ensure that each employee knows their job's standards and responsibilities? Does each team member understand how his or her portion of the project is important to overall project success?

3. **Work to secure good communication with employees as individuals and as a team.**

   Do team members feel their input and suggestions are valued? Do they receive regular feedback on how they are doing? Is advance warning of changes conveyed whenever possible, along with reasons why changes are necessary? Are regular exchange meetings held? Are team members included in decision-making?

4. **Establish individual and group goals, preferably in co-ordination with those concerned.** Are individual goals established for each team member? Is consideration given to each individual's opportunities for professional development? Are group goals established and communicated to the team? Is a goal established that encourages growth in team development factors-team planning, conflict resolution, and problem solving?

5. **Reward teamwork and team-building efforts.** Who issues rewards? Project managers? Functional managers? Are rewards mostly based on factors surrounding the job environment-pay, bonuses, and working conditions or are they based on factors having to do with the job itself, such as accomplishment, recognition, responsibility, and growth? Does management know the difference between rewarding an individual as a member of a team and rewarding an individual as an individual? Are individuals singled out and rewarded for their performance on the project team? Do team members have input into what and how rewards are given and to whom?

6. **Practise and encourage loyalty to the team.** Does the project manager defend team members against unfair criticism? Is there a climate of trust in the project team? Do project managers practise effective leadership?

Table 2.4 - Six Key Team-Building Elements

Their research revealed that the companies in the survey were not doing a good job at teambuilding. They also found that a company's size, age, and organisational structure influenced the likelihood of successful team building. For example, matrix organisations perform better than traditional (functional) organisations. They also showed that awareness, commitment and training are required to achieve a world-class level of team building.

Lutz (1994) described Chrysler's experience with cross-functional teams. Chrysler replaced their traditional way of organising people by what they called "platform" teams. These are a kind of "core team" as described by McGrath et al. (1992).

The economical advantages achieved by Chrysler were significant. They also found that physical co-location was the way to get expected results from teams.

Dyer (1995) classifies the differences between staff and a team, as shown on table 2.5. He presents a team development model (see figure 2.7) where leader and group power are measured based on a team-maturity scale.

When a team starts working together, they need to get used to each other. Some formal and informal rules are established and they rely very much on the leader capability of describing clearly the activities that shall be taken. Therefore, at this stage the leader acts mainly as an educator and the group cannot have much delegation (or power) due to its low capability of pursuing a common goal.

As the team progresses, they become more effective and mature, the leader can act as a coach or even as a facilitator. The delegation increases and, the team and the leader are recognised by the organisation as people who accomplish well the assigned tasks, which give them more power.

CHARACTERISTIC	STAFF	TEAM
. Goals and decisions	Made by the boss	Made jointly by team and boss
. Assignments	Made by the boss	Made jointly by the boss and subordinates
. Communications	In a meeting are primarily between the boss and a subordinate	Are open among all team members
. Role of subordinate	Primarily to carry out assignments	Team members initiate action, make suggestion, and help in planning
. Primary virtues	Loyalty and being a "good soldier"	Trust, helping, and creativity
. Sharing of data	Data shared on basis of what people feel the boss wants	All relevant data shared
. Critical feedback	Rare and anxiety provoking	Regarded as important to improvement
. Differences and conflicts	Avoided or smoothed over	Regarded as enriching; worked through
. Work	Each staff person responsible for own work	Team members feel responsible for one another
. Goal	Boss's primary goal is to get the job done	Team leader works to get results and develop team members

Table 2.5 - Differences between Staff and a Team

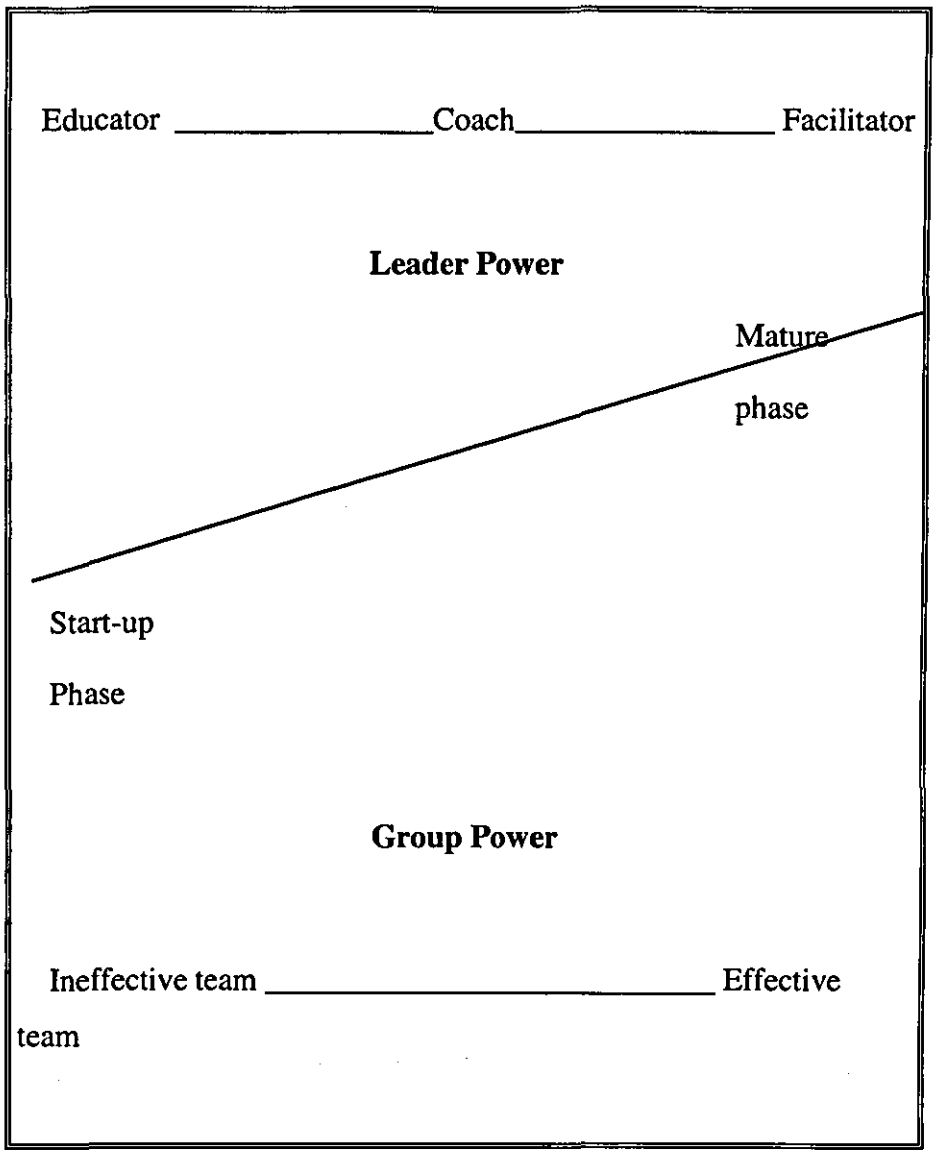


Figure 2.7 - Team-Development Model

Goldratt (1994) presents a detailed framework to allow constant win-win negotiating, evidencing that employees can be trained to have a more effective relationship during their work time activities, which in turn contributes very much to a team-working culture.

2.8 Managerial profile change due to privatisation process

Bishop and Green (1995) state that British privatisation has become a model for privatisation the world over. The concept of privatisation in Britain first arrived in the political mainstream in 1978, in a policy document prepared for the then opposition Conservative party which proposed state sell-offs as a possible means to reduce the power of public sector trade union. In total, the Government raised more than 40 billion pounds from privatisation by stock market flotation and subsequent sales of minority holdings in privatised firms.

Bishop and Green (1995) reinforce that the final goal of privatisation was to improve the performance of firms that were sold. It is thus important to consider why privatisation might be expected to improve firm performance. One obvious reason is that privatisation can free firms from the constraints of government control, such as political interference in decision making, limits on investment driven by political and macroeconomic forces rather than commercial criteria and unwieldy, politically appointed management boards. Privatisation can allow firms greater freedom in personnel policies, to tap the world's capital markets to fund new investments and, through the possibility of hostile takeover and bankruptcy, to be disciplined by those markets. Many of the trends in performance of privatised firms as a whole that were in evidence at the end of the 1980's have continued into the 1990's.

Bishop and Green (1995) study set out to establish whether the so-called privatisation miracle observed during the high economic growth years of the 1980's continued to hold true after the worst recession in Britain for more than fifty years. They found clear evidence that these firms took advantage of commercial and managerial freedoms that had been denied them prior to privatisation. Recession seems to have had relatively little effect on the performance of these firms.

Cragg and Dicky (1999) investigated whether privatisation works by disturbing "the best of all profits" of stated ownership, a quiet life. According to them, one characterisation of owner-manager relationship under state ownership is that managers are effectively treated like bureaucrats and are rarely fired, and firing is unrelated to changes in a firm's financial performance. They examined the links between ownership and internal control for a sample of 112 stated owned, privatised, and publicly traded firms in the United Kingdom from 1970 to1994.

To examine the links between ownership and internal control, they investigated the level of management resignation and the sensitivity of management resignation to changes in firm financial performance.

Their principal finding is that privatisation is associated with an increased sensitivity of resignation and fires to changes in financial performance. In firms with at least four years in the private sector, managers were more likely to resign when the firms performed poorly.

For the executives in stated-owned companies, they found no evidence of turnover sensitivity related to performance in the period before the government announced its intention to privatise. The privatisation event itself appears unique. There is a greater government attention to financial performance in the build up to privatisation. There is also no apparent relationship between turnover and financial performance using accounting returns in the early years of privatisation.

Cragg and Dicky (1999) mentioned that their analysis of management replacement surrounding and following privatisation in the United Kingdom echoes the results from Eastern Germany, Russia, and Mexico and suggests that the replacement of human capital is an important part of the privatisation process. Apparently, private owners think that it is not sufficient to change incentives but that personnel also need to be changed. The scramble to hire top executives with strong financial and marketing credentials around privatisation suggests that executives in state-owned firms lacked a number of the skills necessary to manage a large publicly traded corporation.

2.9 Research Methods Analysis

Saunders et al. (2000) states that business and management research need to provide findings that advance knowledge and understanding, and it needs also to address business issues as well as to provide a process for solving managerial problems. He categorises two extremes of research: (a) basic research - is undertaken purely to understand the processes of business and management and their outcomes, and (b) applied research – is of direct and immediate relevance to managers, addresses issues which they see as important and is presented in ways which they understand and act on. He understands that the research process is not straightforward. The stages need to be revisited along the way. Such stages varies but they usually include formulating and clarifying topics, reviewing the literature, choosing a strategy, collecting data, analysing data and writing up.

Clarifying topics: identifies the objective of the research

Reviewing the literature: forms the foundation on which the research is built. Its main purpose is to help developing a good understanding and insight into relevant previous research and the trends that have emerged.

Choosing a strategy: is related to deductive or inductive approach. Main strategies are experiment, survey, case study, grounded theory, ethnography, action research, cross-sectional and longitudinal studies, and exploratory, descriptive and explanatory studies. It should be ensured results are reliable and valid.

Collecting data: sampling techniques may be probability or non-probability samplings. For populations under 50 it is usually more sensible to collect data from the entire population where you are considering using probability sampling. Where it is not possible to construct a sampling frame it is necessary to use non-probability sampling technique. Data can also be collected through a technique named participant observation, which is a qualitative research. If the observer takes part in an activity and his identity is concealed he will be named "complete participant". If his identity is revealed he will be named participant as observer". On the other hand, if the researcher observes activity and his identity is concealed he will be named " complete observer". If his identity is revealed he will be named "observer as participant".

Semi-structured observation:

According to French (1993), observation is a research method where the researcher studies behaviour by watching and listening, either from the outside or by participating in the activities under investigation. It is suitable for investigating both verbal and non-verbal behaviour, as well as the environment in which the behaviour takes place. It is a very useful method for studying behaviour directly; the correlation between what people say they do, and what they actually do, is often low, which makes both the interview and the questionnaire of limited value for behavioural studies.

In structured observation, researchers decide exactly what to observe beforehand and devise an observational schedule that will allow the information to be categorised in a highly specific and systematic way. In unstructured observation, researchers do not attempt to manipulate the situation they are investigating, instead they are interested in events as they occur naturally, and in the total situation rather than specific aspects of it.

Semi-structured observation is somewhere between structured and unstructured observation. With semi-structured observation, researchers will be more concerned with some aspects of the situation than others, but they will also be keen to record any unusual or unique events as they arise, and will give data of that type considerable emphasis in their analysis.

Semi-structured interviews:

According to French (1993) interviews can be highly structured, where they are little more than spoken questionnaires, or totally unstructured, where they resemble an ordinary conversation. Most interviews fall somewhere between these two extremes, being classified as semi-structured interviews. With a semi-structured interview the interviewer knows what information is required but is free to alter the wording and ordering of the questions with individual participants. Although the subject matter of the interview is specified, participants are given considerable freedom to express themselves as they wish.

Documentary research:

According to French (1993), documentary research refers to the analysis of written documents such as official reports, textbooks, newspapers and novels, and visual and auditory material, such as films, posters, notices, paintings and photography can all be used in documentary research, as well as data stored on computers.

Analysing data and writing up: Data may be either qualitative or quantitative. Quantitative data are based on meanings derived from numbers, collection results in numerical and standardised data, and analysis conducted through the use of diagrams and statistics. On the other hand, qualitative data are based on meaning expressed through words, collection results in non-standardised data requiring classification into categories, and analysis conducted through the use of conceptualisation.
A suggested structure to a report is: abstract, introduction, literature review, method, results, conclusions, references and appendices.

Abstract: it is a short summary of the complete content of the project report. This enables those who are not sure whether they wish to read the complete report to make an informed decision. It should contain response to the following questions: What were my research questions and why were these important? ; How did I go about answering the research questions?; What did I find out in response to my research questions?; What conclusions do I draw regarding my research questions?

Introduction: it should give the reader a clear idea about the central issue of concern in your research and why you thought this was worth studying. It should also include a full statement of your research questions and research objectives. It is also important to include in this chapter a "route map" to guide the reader through the rest of the report.

Literature review: the main purpose is to show the reader how your study supplements the work that has already been done on your topic. The following check list can be used for evaluating the literature review: Does your review start at a more general level before narrowing down?; Does the literature covered relate clearly to your research questions and objectives?; Have you covered the key theories?; Have you covered the key literature or at least a representative sample?; Are those issues where your research will

provide fresh insight highlighted?; Is the literature you have included up to date?; Have you been objective in your discussion and assessment of other people's work?; Have you included references that are counter to your own opinion?; Have you justified clearly your own ideas?; Is your argument coherent and cohesive – do the ideas link together?; Does your review lead the reader into subsequent sections of your project report?

Method: it should give the reader sufficient information to make an estimate of the reliability and validity of your methods. Points of inclusion: what was the research setting?; Why did you choose that particular setting?; How many participants; How were they selected? ; What were their characteristics?; How were refusals/non-returning handled?; What tests/scales/interviews or observation schedules/questionnaires were used?; How were purpose-made instruments developed?; How were the resulting data analysed?; What were the characteristics of the interviewers and observers and how were they trained?; How valid and reliable do you think the procedures were?; What instructions were given to participants?;
How many interviews/observations/questionnaires were there; how long did they last; where did they take place?; When was the research carried out?

Results: it is important to report the facts that your research discovered (findings), and not conclusions. The first should be headed "what I found out" and the second " what judgements I have formed as a result of what I found out". The findings should be structured in a clear, logical and easily understood manner.

Conclusion: for each finding should be at least one conclusion. It is the conclusion that will demonstrate whether research questions were answered, and show the degree of insight that is exhibited in reaching the conclusions. Answering the research questions, meeting the objectives and, if appropriate, supporting or otherwise the research hypotheses is the main purpose of the conclusions chapter. You should also return to your literature review and ask yourself " what do my conclusions add to the understanding of the topic displayed in the literature?

According to Fink (1995) the best surveys have these features: specific objectives; straightforward questions; sound research design; sound choice of population or sample; reliable and valid survey instruments; appropriate analysis; accurate reporting of survey results; reasonable resources.

Burns (2000) states that the word hypothesis is generally used to explain observations. A hypothesis is a hunch, an educated guess, which is advanced for the purpose of being tested. If research were limited to gathering facts, knowledge could not advance. The formulation of hypotheses follows logically from the review of the literature on the problem. The hypothesis must be stated so that it is capable of being either confirmed or refused. The following criteria may be used to judge a hypothesis:

- Hypotheses should be stated clearly, in correct terminology, and operationally.
- Hypotheses should be testable
- Hypotheses should state differences or relationship between variables
- Hypothesis should be limited in scope
- Hypotheses should not be inconsistent with most known facts. All hypotheses should be grounded in past knowledge.

2.10 Main Definitions adopted by the author:

Behaviour: is the term given to things that human beings do and can be directly detected by the senses of others". Formal organisations exist to achieve particular goals through the behaviour of their members - Huczynski (1991).

Business Process Re-engineering (BPR): Processes is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer. Re-engineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed - Hammer and Champy (1993).

Complex product:

- Development cycle time (longer than 1 year)
- Development cost (higher than US$ 10 million)
- Number of involved technologies (higher than 50). One technology is considered as a group of knowledge areas required to develop a function of the product under development (for an aeroplane development examples of technologies are: structures, aerodynamics, on-board systems – avionics, air-conditioning, electrical, hydraulics)
- Number of suppliers (higher than 50)

Author's own definition

Concurrent Engineering: strategic concept, leading to the systematic approach of the integration of design, production and related processes dealing with all aspects of the product life cycle (included manufacturability, assemblability and repairability considered at the earlier phases of the design process) - Michelletti (1994).

Corporate processes: major processes in a corporation – Author's own definition.

Culture: a pattern of basic assumptions – invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems - Schein (1985).

Integrated Product Development (IPD): It is a systematic management approach that stresses the use of multidiscipline product teams, and integrated/concurrent processes, to develop products and processes that meet customers expectations relative to performance, cost quality, schedule, maintainability, reliability, and safety – Douglas Aircraft Company.

Major changes: changes that affect the operational strategy established to a corporate process – Author's own definition.

Managers: individuals who achieve goals through other people - Robbins (1993).

Organisation: is a consciously coordinated social unit, composed of two or more people, that functions on a relatively continuously basis to achieve a common goal or set of goals - Robbins (1993).

Organisational behaviour: interdisciplinary field dedicated to the study of human attitudes, behaviour, and performance in organisations - Daft (2000).

2.11 Conclusion:

The management of major changes in corporate process shall take into consideration the corporate culture in order to define management and organisational behavioural changes to be implemented to support the new way of working,

Business Process Re-engineering (BPR) and New Product Development are considered major changes in corporate processes. A continuous campaign to change employees' behaviour may lead, in long term, to a cultural change. In order to speed up such cultural changes, organisational changes should be implemented with revision of roles and responsibility.

Business Process Re-engineering (BPR) is not limited to a new "recipe" of how to conduct business. It requires deep cultural transformation of the involved people to succeed. Some authors associate the probability of success of a re-engineering endeavour to the preparation of companies' employees and leaders to the expected changes, referring to that as the BPR positive and negative pre-conditions to succeed. The chosen process (New Product Development) has evolved very much in the last decade and is still being submitted to fundamental changes. Most of the alterations in the NPD are related to organisational aspects such as organisational structure, team-working and management approaches.

The new managerial trends reinforce both BPR and NPD evolution because the industry competitiveness demands new ways of doing business to achieve the required results.

In addition, the privatisation process demands a change in the managerial profile of stated-owned companies, requiring a greater accountability for financial results.
The literature survey description stressed the need to change the present management mental models towards a more integrated and holistic approach.
It is very important to keep in mind the benefits described by Senge (1990) about systems thinking. If a great effort is carried out towards BPR and NPD with no change in the management culture, the predicted results are unlikely to happen. It is estimated that 50% to 70% of the companies that undertake re-engineering do not achieve the results they hoped for.

Considering the gathered information about BPR, NPD and managerial trends, the author believes that the key factor of success when re-engineering a process is associated with management behaviour (resistance to change) aspects.

Based on that, the author has decided to investigate whether the management behaviour was the major problem in process re-engineering; consequently, several ways to improve managers' acceptance to the expected changes have been proposed. This is an important contribution of this work, as the author did not find in his literature survey, any guideline on how to prepare the industry managers to the required behavioural changes.

3. Chapter 3: Research Hypothesis

Summary

Chapter 3 proposes the hypothesis to be tested and the structure of subsequent research studies is discussed as well.

3.1 Hypothesis background

The author carried out a research study about design methods utilisation, with a group of people in the Engineering Design Institute, in the beginning of 1995, as described by Wright et al. (1995).

Such a research revealed that:

- Many companies were unaware of the potential benefits of available design methods to product quality.
- Companies that implement TQM (Total Quality Management), as a management strategy, have an increased perception that a particular method contributes strongly to improving product quality, over companies which do not implement a TQM management strategy.

As a consequence, the author realised that managers' perception and knowledge about design methods could be a key factor of success to the adequate use of them during the product development process.

In addition, considering:

- Author's experience at the case study company
- Author's visit to 13 UK companies during the research above referred
- Author's initial literature review

The following hypothesis was formulated:

3.2 Hypothesis statement:

Hypothesis:

Major changes in corporate processes are impaired by management behaviour

Major changes are defined (by the author) to be changes that affect the operational strategy established to a corporate process.

As already described in chapter 1, the term process, referred in this thesis, is based in Hammer and Champy (1993) definition, as follows:

"Processes is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer". Corporate processes are defined as the major processes in a corporation.

The term behaviour, referred in this thesis, is based on Huczynski (1991) definition, as follows:

"Behaviour is the term given to things that human beings do and can be directly detected by the senses of others". According to him, formal organisations exist to achieve particular goals through the behaviour of their members. In addition, he says that learning is the process of acquiring knowledge through experience, which leads to a change in behaviour.

The author did not find in his literature search a study relating management attitudes to change in corporate processes. In spite of that, the author would classify the following attitudes and behaviour as crucial to support corporate processes changes:

Attitudes:

- Good faith;
- Respect for people's behaviour;
- Promptness to change;
- Business results rather than individual results;

- Knowledge of business drivers;
- Respect for cultural diversities;
- Open communication;
- Customer oriented

Behaviours:

- Pursue knowledge of customer needs;
- Listen to understand;
- Speak to be understood;
- Assume entire responsibility for assigned activities and associated results;
- Prompt to communicate, mainly when results deviation are predicted;
- Cooperate to team members;
- Delegate activities;
- Generate opportunities;
- Assess, manage and take risks;
- Reward participants;
- Recognise other's contributions;
- Think as if you were the president of the company

These area the type of management behaviour to which the hypothesis refers.

The hypothesis was tested focusing the following areas:

- Re-engineering of the New Complex Product Development Process
- Business Process Re-engineering in Post Privatisation companies

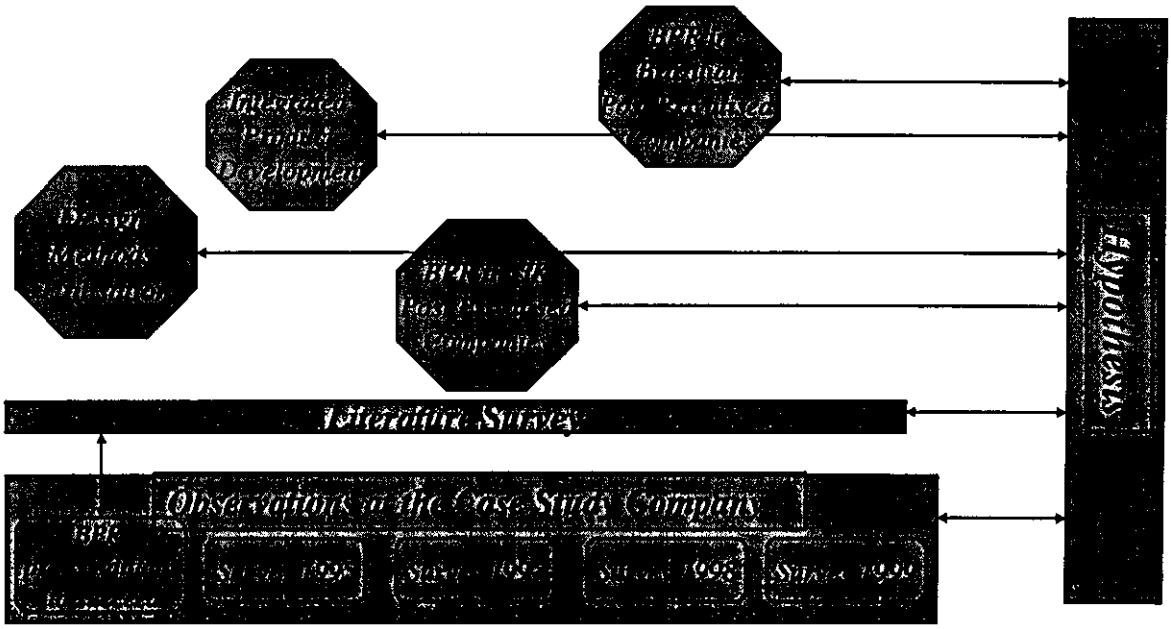
Those areas were chosen because they represent major changes in corporate process and the author could develop a comparative observation between the company he works for, a Brazilian aircraft manufacturer (Embraer), and other surveyed companies.

The following research studies were carried out to test the hypothesis:

- **Research study number 1:**
  Surveys on New Complex Product Development Process
- **Research study number 2:**
  Surveys on Business Process Re-engineering (BPR)
- **Research study number 3:**
  Observation at the case study company

These research studies were concentrated on proving that management behaviour, generally speaking, would impair corporate processes changes rather than concentrated on which management behaviour contribute positively or negatively to corporate process change success.

3.3 Research studies structure



The research on design methods utilisation, described by Wright et al. (1995), gave the foundations to the hypothesis statement. The research on Integrated Product Development number 1 revealed the high complexity of IPD and the consequent cultural changes that are required to succeed. The research number 2 and 3 revealed how post privatised companies face BPR, investigating which are the main obstacles to re-engineering a process and which are senior managers expectations against actual results. The author collected the senior managers perspective without any influence in order to prove that cultural changes (or behavioural aspects) are the main obstacles to re-engineer. The research study number 4 was considered a live laboratory to observe a successful cultural change concerning BPR, specially concerning IPD implementation. Since the case study company was seen as the place to observe practical transformations taking place, the niche of surveyed companies were restricted to privatised companies or companies which had a complex product development process.

The following sections describe the main findings of research studies described above. :

4. Chapter 4 - Research study number 1: Surveys on New Complex Product Development Process

The re-engineering "boom" that occurred during this decade has been presenting contradictory results: some companies declare that they have achieved excellent results while other companies declare that their re-engineering projects have failed.

The author had already performed a survey about methods utilisation during the design process in UK industries (Wright et al. – 1995). That survey revealed that the design methods utilisation is impaired by the perception of senior managers about them and it is also impaired by the company strategy and acquired knowledge about the product development process.

The author decided to carry out a survey with major North American Aerospace companies to evaluate the main challenges associated with the implementation of the Integrated Product Development philosophy, which is a re-engineering of the product development process. The survey was carried out in North America due to the high concentration of major aerospace companies.

The Integrated Product Development process demands a cultural change in the companies that decided to implement it because it requires team-working, cross-functional activities, development cycle revision and customer driven strategies. Therefore, IPD requires the integration of several departments of the company (e.g. marketing, engineering, production, supply, technical assistance) to achieve desired results, i.e., reduced time schedule and cost, and meeting the expectation of the market.

The author also decided to choose the company he works for as a case study company because Embraer is internationally recognised as a company that produces good quality aeroplanes, and it is responsible for the entire product development cycle. Besides, Embraer was, at that time, willing to implement the IPD as a strategy to improve its competitiveness in the market. Consequently, organisational and process aspects were stressed during that research.

4.1.1 Research objective:

The author led this survey to evaluate how the major aerospace companies in North America were facing the Integrated Product Development (IPD) concept implementation in their working environment. All the interviewed people were directors or senior managers.

4.1.2 Selected research methods:

Semi-structured interviews. (See definitions of design methods in section 2.8)

4.1.3 Research methods - selection justification:

The semi-structured interview method was chosen because the subject was very complex and the responses could vary widely from company to company. The author did not have enough information about the subject to prepare an adequate questionnaire that could identify the trends of the New Complex Product Development (NCPD) process. The subject was very broad and fairly new at the time.

4.1.4 Sample identification:

The aerospace industry was chosen to compare with the case study company, which was trying to get information on this concern to establish goals in the coming years. 11 companies were selected from the most important in North America (5 aircraft manufacturers, 1 engine manufacturer, 1 electronic manufacturer, 3 software houses and 1 aeronautical consultant). The sample was quite representative of the leading companies in the aerospace segment. It was a purposive sampling (judgmental sampling) because the target was not to represent the aerospace companies' population but to identify the trends in the leading North American companies. However, it shall be pointed out that the identified sample is very small, making it difficult to generalise the encountered results (see section 8.2 – Success and limitations of the work).

4.1.5 Desired respondent profile:

Industry leaders. Preferably experienced managers or directors.

4.1.6 Data collection method:

All the data was collected during the semi-structured interview through written notes. No recording was included because it could cause some inhibition to the interviewed people who were supposed to talk about confidential subjects that could reveal company strategy towards new complex product development process, which could be considered a competitive advantage. As the investigating team was composed of four people from different areas of the case study company, all of them took notes during the interviews and a detailed report was written afterwards for each company visited.

4.1.7 Survey structure:

A preliminary literature survey and an analysis of the impact of IPD in the case study company, allowed a very objective investigation of the main issues associated with IPD implementation, although that subject was not completely known by the author at that time. A very simple interview guideline was prepared addressing the main topics to be discussed and an agenda was proposed to all of the benchmarked companies.

Analysis of the questions:

The interview guideline was divided into three major blocks, as follows:

- **Organisational aspects:** How they faced the teamwork approach, which cultural barriers they had to overcome and how they implemented the IPD
- **Tools:** Which computer tools they had been using such as CAD systems, Design for Manufacture and Assembly (DFMA) software, Design to Cost (DTC) software, etc
- **Process:** How they have assessed their processes to comply with IPD philosophy

These questions were very open to allow them to talk freely about their working process. In order to give them some confidence, a brief presentation of the case study company, addressing openly the case study company NCPD process, was conducted before starting the interview.

The interview was structured to investigate the major challenges of companies that were implementing the re-engineering of complex products. Considering that the interviewed people were senior managers, they could reveal their perspective to such a complex

re-engineering, allowing the interviewer to realise what were the main problems faced during such endeavour. Based on that specific information, the author was able to prepare a generic questionnaire about BPR, applicable to any other company, in order to find out the influence of senior management in the success of BPR, which is the aim of this thesis.

4.1.8 Survey conduct:

An EMBRAER multi-functional team from Engineering (represented by the author), Production, CAD systems and Information Technology carried out this benchmark. Most of the interviewed people had a very high level position inside the company (director or high level manager), which gave a very broad view to the benchmark. A report was written for each company, describing the main aspects of the Integrated Product Development. This survey was carried out in October/November 1995.

The following companies were visited:

Lockheed Martin, Sikorsky, McDonnell Douglas, Boeing, Pratt & Withney, National Space and Flight Center (NSFC), Boeing Aerospace, Boothroyd and Dewhurst Incorporation (BDI), Computer Science Corporation (CSC) – 2 sites - and Intergraph.

The first seven companies, described above, are aircraft manufacturers or aircraft parts suppliers. The remaining ones are consulting or software manufacturers, which supply hardware, software or consulting work to the product development process in the aerospace business.

Each company revealed its own strategy for IPD implementation. All of them stated that a great organisational transformation was occurring due to the IPD implementation. This report does not describe all of the details for each company because they may be considered confidential. However, a summary of the main findings is herein presented:

4.1.9 Main Findings:

4.1.9.1 Lockheed Martin:

Participants: Technical director, teaming director, manager of best practices/variability reduction, manager of program manufacturing engineering.

The company presented its evolution in the product development process. They revealed several initiatives implemented in the past, such as quality circles, performance management teams, total quality management, and concurrent engineering. More recently, they started the implementation of the integrated product development. The first two projects based on the IPD philosophy were started in 1993. They performed a benchmark with several companies and, based on that, they selected the 12 best practices: cost as a design requirement, supplier partnership, embedded quality system, requirements management, customer focus, product & line validation, risk management, simultaneous development, teaming & skills, key characteristics, cost management and variability reduction.

They revealed that the company was implementing an ambitious cultural change programme. The teaming strategy (team culture) is seen as a key point to that. This is the reason they have assigned a teaming director to implement such an organisational change in the

company. They have prepared plenty of didactic material to prepare and train the employees in the team culture. They have already assigned hundreds of teams. They use the "core team" concept (McGrath, 1992).

The Design for Manufacture and Assembly (DFMA) practice implementation revealed outstanding results (a reduction of 40% in the number of parts and a 20% cost reduction).

They also revealed that the big challenge was to adapt the existing systems to the new working philosophies.

They intended to have all projects following the IPD philosophy by the end of 1996.

4.1.9.2 Sikorsky:

Participants: Design to cost manager and design to cost engineer

The company was experiencing a great transformation supported by two consulting companies (Andersen Consulting and Management Science Inc.).

They had already used several initiatives such as total quality management, poke yoke, kaizen, however, without a clear management approach. They have been implementing the Integrated Product Development philosophy. They use the "core team" concept (McGrath, 1992). They stated that in the S92 Program (helicopter development) no longer is there a traditional tree structure with a hierarchy of reporting paths.

Independent product development teams are established for each of the major modules of the design. The teams are individually empowered to produce their "product" with the minimum cost and weight. The following recommendations were given to implement the IPD:

- Start with a vision
- Run pilot programmes: gain experience and plan to succeed
- Limited deployment: focus on projects which can bring the maximum benefit
- Training: focus on new skills and skill to learn
- Do not frequently change the team members
- Create team for systems integration

4.1.9.3 McDonnell Douglas

Participants: Deputy General Manager, affordability/DFMA, wide body program manager, aircraft systems and interior manager, affordability project manager, general manager for Integrated Product Development, Vice-President, general manager for design and technology.

They prepared a document providing the step-by-step action to work in the IPD environment. Several projects and programs were already using the IPD philosophy. They use a matrix organisation inside the program organisation and they assign teams to the design of each aircraft segment (named product centres) – Shaw et al. (1993).

They started the IPD implementation in 1991 and they adopted the following definition for IPD: Integrated Product Development (IPD) is DAC's approach to achieving first time quality in the definition, production, and support of its products. It is a systematic management approach that stresses the use of multidiscipline product teams, and integrated/concurrent processes, to develop products and processes that meet customers' expectations relative to performance, cost quality, schedule, maintainability, reliability, and safety.

The key elements in the IPD philosophy are:

- Discrete development phases with formal exit review
- Multidiscipline teams
- Involvement of customers and suppliers throughout product development process
- Organisation, resource allocation, and budgeting that supports IPD environment
- Formal requirements definition, allocation, and tracking using the systems engineering methodology
- Integrated planning and schedule
- Concurrent release of master product definition

McDonnell Douglas assigned a team to co-ordinate the development and implementation of IPD. They also assess the IPD evolution based on a process that enables them to evaluate the transition of the company to a mature IPD environment.

They revealed that they were still evolving in the IPD philosophy and a strong cultural transformation had been occurring in the company.

4.1.9.4 Boeing Computer services/ Boeing Commercial Airplanes

Participants: The director of product and process development and factory systems, the manager of market development for Dassault Systemes, and a CAD consultant for Boeing company.

The company was experiencing a transformation that had started 6 years before, aiming to be managed by business processes. They created 5 major processes:

- Acquisition – partners and sub-contractors
- Define – corresponding to the product definition

- Produce
- Customer support
- Business resources

For the development of Boeing 777 the company assigned 228 Integrated Product Teams (IPT). The director revealed that at the beginning they had evening meetings with the teams to consolidate the team culture. All the teams were co-located and supported by electronic tools such as the electronic mock up.

They stated that the preferred processes are:

- Concurrent product definition
- Integrated Product Teams and Design-Build Teams
- 100% digital product definition
- Digital pre-assembly
- Integrated work statement
- Integrated schedule

4.1.9.5 NSFC (National Space and Flight Center):

Participants: An Intergraph/NASA PMO account executive, an Intergraph senior manager, an Intergraph NASA CAD manager.

It should be pointed out that all participants were associated with electronic tools for product development.

The organisation is divided into laboratories, each one developing a function such as structures, avionics, and propulsion. Multidiscipline teams are not formally assigned and they adopt a matrix management approach for each program.

Due to the non-industrial approach of the organisation it was not possible to identify a unique product development process. Techniques like Quality Function Deployment (QFD), Design for Manufacture and Assembly (DFMA), Integrated Product Development (IPD), and Design to Cost were not used in the NSFC according to the participants.

4.1.9.6 Boeing Aerospace:

Participants: CAD/CAM manager and CAD/CAM engineer

The company presented an organisation similar to the one described for the Boeing Commercial Airplane with co-located Integrated Product Teams.

4.1.9.7 Pratt & Whitney

Participants: Managers associated with the product development

The company was experiencing a gradual transformation to work with Integrated Product Teams (IPT) since 1991. IPTs associated with major components of the engine carried out the design. Teams were co-located in Toronto and Montreal and they had a strong use of electronic interchange data system and also face-to-face meetings to integrate all the teams. They relied strongly on the available computer tools to manage the project.

4.1.9.8 Remaining companies: (Boothroyd and Dewhurst Incorporation (BDI), Computer Science Corporation (CSC) and Intergraph).

Participants: Managers associated with product development tools and methods.

These companies presented the evolution of some tools, which support product development processes such as DFMA, CAD and electronic mock up. It was revealed that several profound changes were about to happen in this area, such as product data manager (PDM) implementation and digital pre-assembly, making the product development process much more supported by advanced tools, allowing simulations and virtual design approaches.

4.1.10 Research Study Conclusion:

Taking into account the above findings, which are considered qualitative data, the author understands that the major challenges to implement IPD could be:

- Legacy data versus technological updating, taking into account the new tools mentioned in the section 3.1.9.8 (PDM, digital pre-assembly, CAD).
- Electronic data interchange with partners, based on the approach described in the section 3.1.9.7 (the experience of Pratt & Whitney is applicable to teams geographically dispersed, which seems to be a trend in new complex product developments due to the growing partnership scheme).
- Better utilisations of design methods, once all visited companies were trying to better structure their product development process.
- The role of functional areas, once all visited companies were matrix organised and they frequently expressed their concern with integration aspects.
- Team culture (empowerment, skills, leadership, etc.). All companies mentioned their experience with team culture implementation and they revealed this might be a key success factor to IPD implementation.
- Employees and managers cultural change, as a consequence of previous conclusions.

The IPD was found to be a very complex process, involving deep transformation of organisational structure as well as adaptation to new computer tools, which demand a considerable cultural transformation to succeed. The IPD philosophy is a radical change when compared to previous product development attempts. Therefore, the analysis carried out to that process might be easily extended to any other company process.

In the IPD survey most of interviewed senior managers reported some concern about cultural aspects, such as teambuilding, managers role in matrix organisation and adaptation to new computer tools.

It was also found that there was no completely mature IPD within the visited companies (some companies utilise maturity models, i.e., a table which describes, for each major contributor of IPD, its degree of evolution in progressive steps). A survey is periodically carried out with the employees to evaluate the degree of maturity achieved by the

company. The more mature the companies are, the better they are expected to perform regarding product development. One example of maturity model for team building is described in the section 2.5 (tables 3 and 4).

The above described research study indicates that a major change in the product development process is taking place in the visited companies. Such a change involves new tools, processes and employees roles and responsibility. It also indicates that the senior managers were realising that such changes would demand a new management approach to succeed. Therefore, managers' behaviour may be a key factor of success to such a major change in the product development process.

5. Chapter 5 - Research studies number 2 (Surveys on Business Process Re-engineering)

A Survey on Business Process Re-engineering (BPR)
-UK privatised companies
-Comparison between UK and Brazilian privatised companies

Summary

The research studies intend to prove that the main problems found in re-engineering processes are related to cultural changes and senior managers expectations.

The research studies were carried out with post privatised Brazilian and British companies and revealed how they face Business Process Re-engineering, which are the main problems and also which are the managers expectations concerning cost, time and benefits associated to BPR.

5.1 Introduction

The survey was carried out during the period January to April 1997 in the UK and from July to September 1997 in Brazil.

5.1.1 Objectives

This survey set out to evaluate whether the privatised companies (in the UK (the United Kingdom) and Brazil) have undertaken BPR, what results have been achieved, and the most important obstacles they have overcome. The author decided to survey post privatised companies in order to directly compare with the case study company, which had recently been privatised. Brazil and the UK were also chosen to compare the effects of different privatisation programmes (UK companies were mostly privatised in the 1980's while Brazilian companies were in 1990's). Additionally, the UK is considered a worldwide reference of success in the privatisation process, and privatised companies in Brazil could be directly compared to Embraer, the case study company.
Prior to undertaking the study, it was the perception of the author and his supervisor's that BPR would find similar results in post privatised companies to those shown by other companies. Therefore, some points considered as classical results in the BPR books have been addressed, as follows:

- Number of companies, which have already undertaken BPR
- Time taken to re-engineer companies business processes
- Cost versus benefits of this strategy
- Common constraints of the BPR

The author aimed mainly to investigate whether management behaviour would impair BPR results. Therefore, the scope of this survey was not limited to New Product Development Process neither to Industry. The focus was to identify the main obstacles to an effective BPR process.

5.1.2 Method

It was decided to follow the classic technique of a postal survey. This was chosen to minimise personal influence over the respondent. A large number of companies were involved at a minimum cost within a relatively short period of time. It was imperative to the success of the survey that a member of company staff who was enough senior and had knowledge of the involved processes would fill in the questionnaire. As a consequence, the questionnaire had to be designed to be as short as possible aiming for an average time of 10 minutes for completion, in order to have an acceptable response.

The questionnaire (see appendix 1) was designed to elicit responses to the following issues:

- **Privatisation starting date**

It was intended to compare the privatisation starting date with all other aspects related to BPR implementation and achieved results.

- **Organisational structure changes**

It was investigated whether the involved companies would have experienced any kind of organisational changes in the first year following the privatisation. This was considered to be a factor that could delay the BPR implementation in a post privatisation company.

- **Use of BPR**

Some questions were formulated to investigate when the BPR had been started, how long the BPR process usually takes and which were the main re-engineered processes.

- **Influence of External Consultants in the BPR endeavour**

It was checked whether the external consultant participated in any phase of the BPR implementation process. The intention was to verify the influence of external consultants on the final BPR results.

- **Main Problems associated with BPR implementation**

A list of traditional problems in BPR was prepared and the respondent could choose up to three options with no weight classification. The intention was to investigate whether a major problem would be common to the surveyed companies.

- **BPR Results**

The results were checked in terms of time, benefits and cost against the original expectations.

5.2 Sample Analysis

The number of privatised companies is very reduced in both countries (the UK and Brazil). Therefore, to have a reasonable number of responses to be analysed, the author decided to send the questionnaire to almost all privatised companies (approximately 45 companies in each country).

5.2.1 Companies

The privatised companies included in this survey were **identified** from the following sources:

UK companies:

- Moran M., Prosser T. - Privatization and Regulatory Change in Europe
- Bishop M., Green M. - Privatisation and Recession
- FAME data bank (Financial Analysis Made Easy CD-ROM).

Brazilian companies:

- Internet site: http://www.bovespa.com.br/bvcamp07.htm
- Data bank from Federation of São Paulo Industries

Response rate:

UK companies:

The questionnaire shown in appendix 1 was sent to 45 UK companies. Twenty-three companies replied and seventeen responses were considered valid ones. Some responses were considered invalid mainly due to the fact that respondent companies had never been privatised (they were private companies since their foundation). It was a data bank problem.
Considering the total number of responses, the response rate (RRt) was 51%

Considering the valid responses, the response rate (RRv) was 38%.

Brazilian companies:

The questionnaire was sent to 42 Brazilian companies. Eighteen companies replied with valid responses.

Therefore, the response rate (RR) was 43%

5.2.2 Respondents

The respondents revealed they held a senior position in the companies, as required in the questionnaire-accompanying letter. Therefore it is expected that they had a good overview of the processes involved. An analysis of the respondents revealed the following:

UK companies:

- 59% of the respondents were designated as company directors.
- 29% of the respondents were designated as managers.

Of the two remaining respondents one was designated head of production services and the other one did not describe his job.

Brazilian companies:

- 39% of the respondents were designated as company directors.
- 39% of the respondents were designated as managers.

Of the four remaining respondents two were designated as Director Assistants, one as Planning Assistant and one did not specify his function.

All questionnaires were sent to directory level of the companies. Consequently, the people who did not respond also belonged to the senior management level of the companies.

5.3 Results

Each question of the questionnaire had a specific objective to be proved. The obtained responses were represented in a graphical way to facilitate the analysis. The analysis was carried out for each country (Brazil and the UK) and also a comparison between both countries was performed.

5.3.1 Sample Characteristics

It shall be pointed out that the identified sample is very small, making it difficult to generalise the encountered results (see section 8.2 – Success and limitations of the work).

Based on the valid responses, we found the following profile of the companies:

5.3.2 Privatisation Date:

Figure 5.1 shows the distribution of the companies based on the privatisation dates.

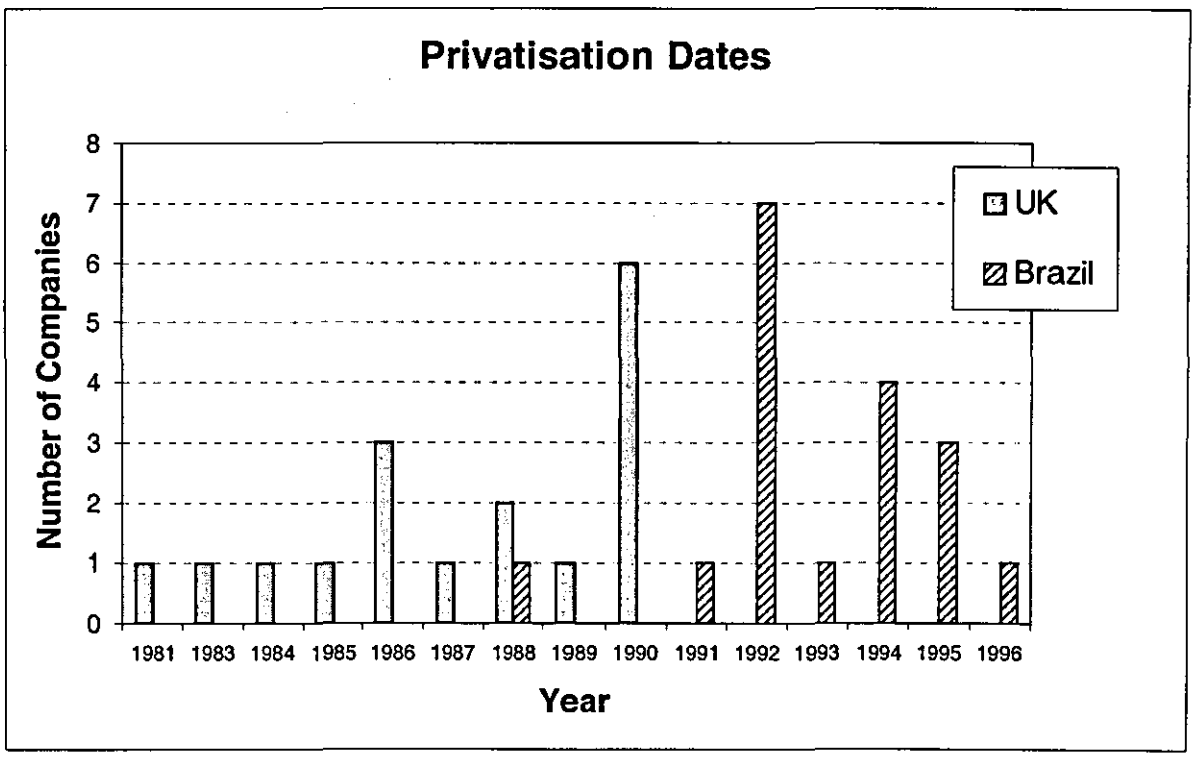


Figure 5.1: Date of Privatisation for the surveyed companies

The UK surveyed companies:

All of the involved companies started to trade as a privatised company before 1991 and 35% of them were privatised in 1990.

Brazilian surveyed companies:

Most of the surveyed companies (94%) started to trade as a privatised company from 1991 and 39% of them were privatised in 1992.

5.3.3 Market Segment:

UK surveyed companies:

9 out of the 17 valid responses were from companies, which belong to the industry segment, and the remaining was from the services segment as shown in figure 5.2.

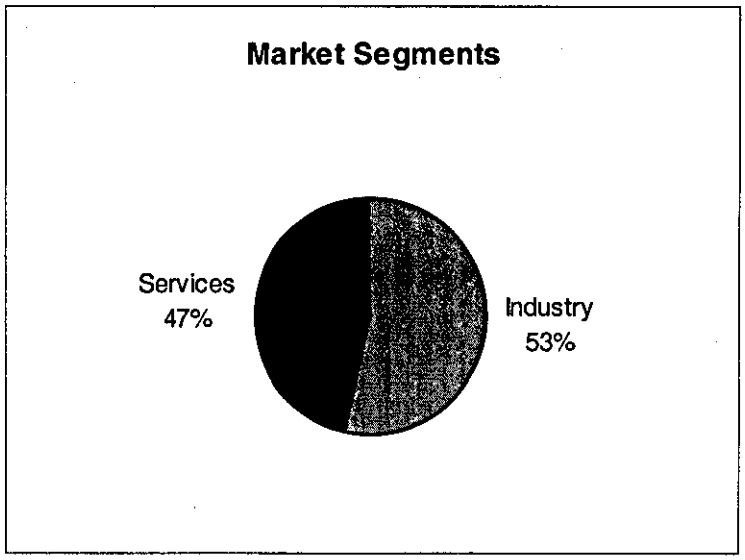


Figure 5.2: Sample division by major market segments (UK companies)

Brazilian surveyed companies:

All the Brazilian companies, which responded to the questionnaire, belong to the industry segment (most of Brazilian privatised companies, in the survey period, were from industry segment. Most of the service segment privatisation started in 1997).
Therefore, every time a significant difference between the UK industry and the UK (services +industry) results occur, it will be highlighted in the graphics.

5.3.4 Organisational Changes

UK surveyed companies:

53% of the companies made some organisational change in the first year following the privatisation. 44% of them classified such changes as being minor and 44% as being major, as shown in figure 3.

Considering that 53% of the companies experienced organisational changes and from those companies about 44% experienced major organisational changes, we can conclude that only 23% of the surveyed companies experienced a significant organisational change in the first year following the privatisation.

Brazilian surveyed companies:

89% of the companies made some organisational change in the first year following the privatisation. For those companies that experienced organisational changes, 31% of them classified such changes as being moderate and 69% as being major, as shown in figure 5.3.
Considering that 89% of the companies experienced organisational changes and from those companies about 69% experienced major organisational changes, we can conclude that 61% of the surveyed companies experienced a significant organisational change in the first year following the privatisation.

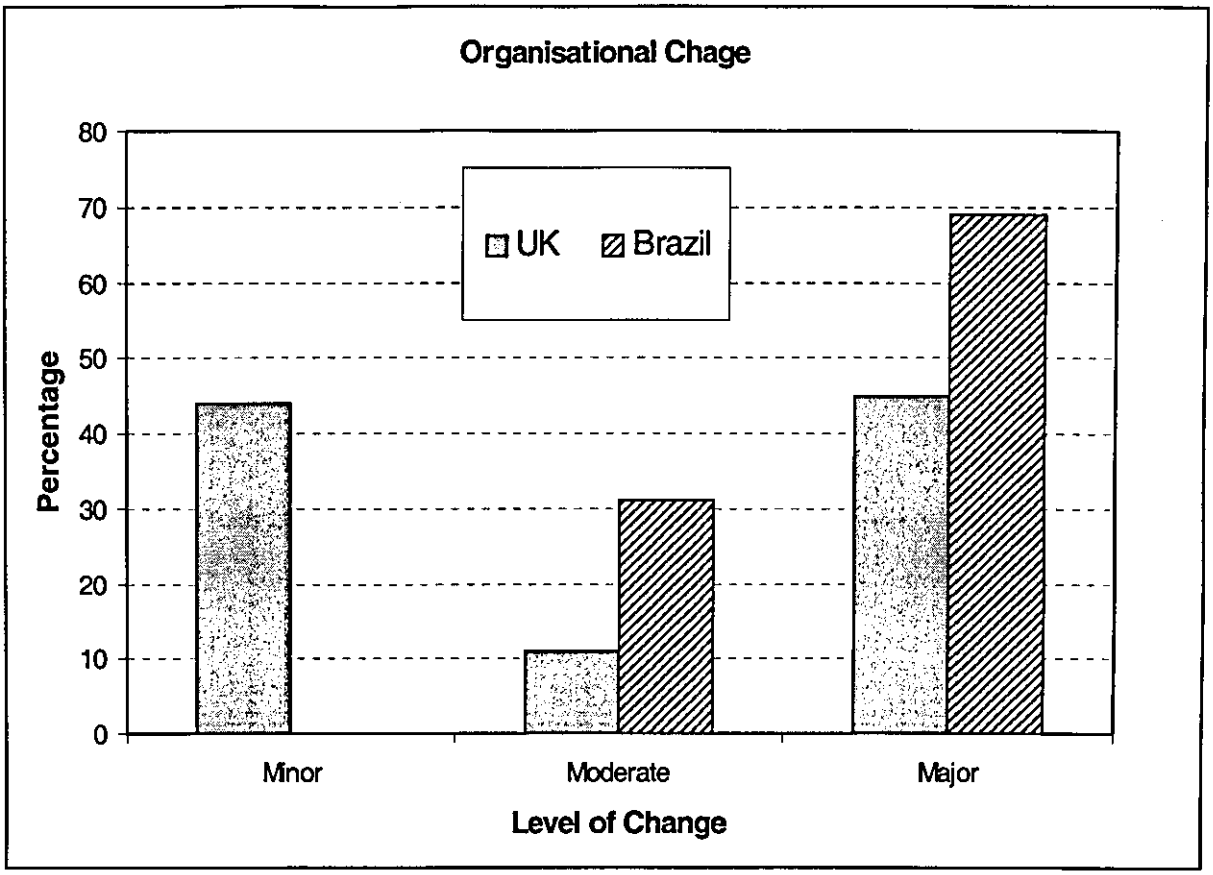


Figure 5.3: Organisational change profile

The classification "minor, moderate and major" may have led to different interpretations (see section 8.2 – Success and limitations of the work)

5.3.5 Use of the principles of Business Process Re-engineering (BPR)

It was revealed that **82%** of the UK surveyed companies and **39%** of Brazilian surveyed companies have used the principles of BPR since their privatisation. The principles of BPR (described in section 2) were not described in the questionnaire. Therefore, different interpretations might have occurred. However, this is not relevant for the purpose of the survey considering that the questions are very broad and generic.

The remaining analysis of this report is related to those companies.

Since the number of UK companies, which have used the principles of BPR, is very high (82%), the sample is very representative of all segments. On the other hand, the segments that are represented by Brazilian companies are siderurgical, petroliferous and aeronautical.

UK surveyed companies:

The BPR was started within the period 1991-1994 for 71% of the companies while 29% of the companies started BPR after 1995. On the other hand, only 21% of the companies have completed the BPR within 1 to 3 years time frame. Most of the companies (79%) are still applying BPR principles. Figure 4 reveals the applicable BPR starting date for those companies, which are still applying BPR principles.

Based on Figure 5.4, it can be concluded that 64% of the surveyed companies that are still applying BPR principles started it from 1991 to 1994. Therefore, it will take more than 3 years before BPR is completed.

Brazilian surveyed companies:

The BPR was started within the period 1992-1993 for 71% of the companies while 29% of the companies started BPR after 1995. On the other hand, 29% of the companies have completed the BPR within 2 to 3 years time frame. Most of the companies (71%) are still applying BPR principles. Figure 4 reveals the applicable BPR starting date for those companies, which are still applying BPR principles.

Based on Figure 5.4, it can be concluded that 75% of the companies that are still applying BPR principles started it from 1992 to 1993. Therefore, it will take more than 4 years for one to consider BPR completed.

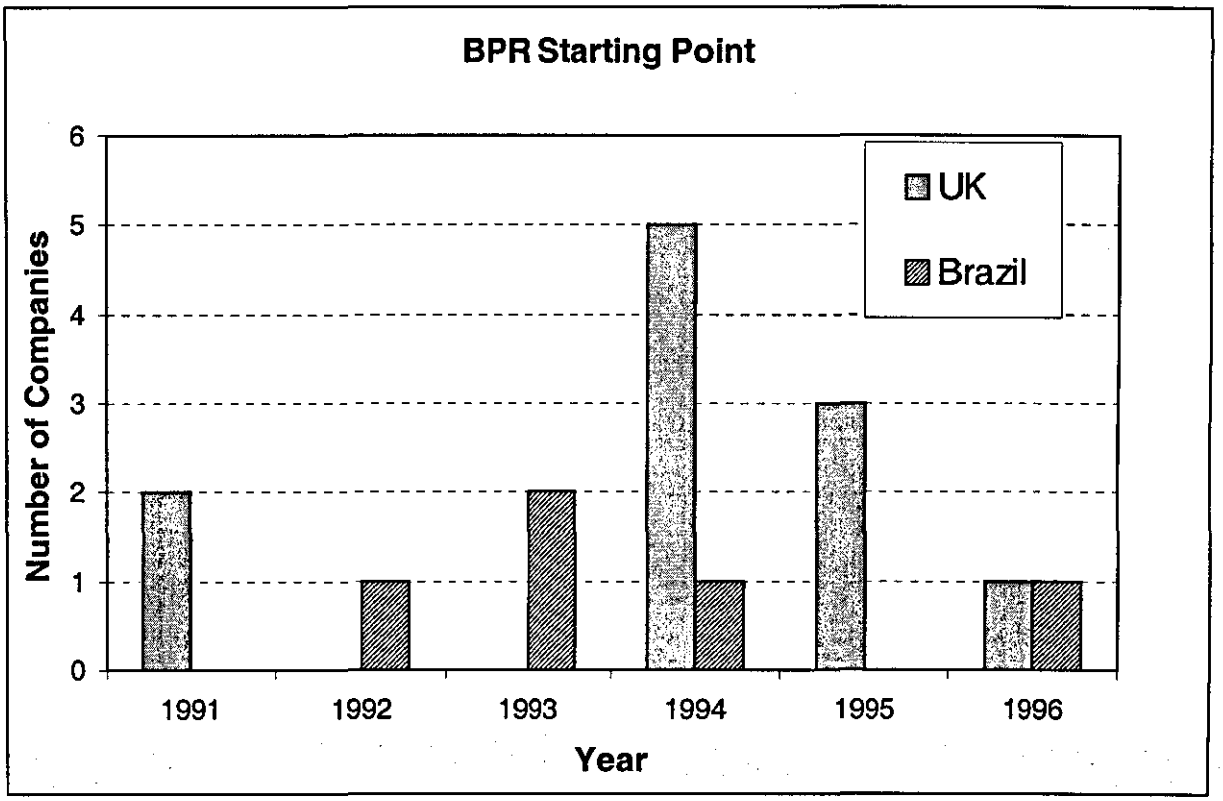


Figure 5.4: BPR Starting Date

5.3.6 Characteristics of the re-engineered processes

The companies were required to describe the main processes that have been modified by BPR. A very simple and qualitative analysis, based only on the titles of the processes indicates the following:

UK surveyed companies:

79% of the companies have not been re-engineering a broad range of processes, which would involve all of the company while 14% of the companies embarked in a more comprehensive re-engineering effort, involving a broader range of processes. One company did not describe its re-engineered processes.
On the other hand, 21% of the companies seem to re-engineer functional areas (e.g. engineering, marketing) rather than customer focused processes (e.g. product development, orders fulfilment)

Brazilian surveyed companies:

Only 29% of the companies have not been re-engineering a broad range of processes, which would involve all of the company while 71% of the companies embarked in a more comprehensive re-engineering effort, involving a broader range of processes.
On the other hand, 29% of the companies seem to re-engineer functional areas (e.g. engineering, marketing) rather than customer focused processes (e.g. product development, orders fulfilment)

5.3.7 Benefits brought by BPR

The degrees of benefits brought about by BPR so far, were rated by the surveyed companies and are shown in Figure 5.5. The types of benefits were not specified in the questionnaire. Therefore, it shall be analysed in a broad sense:

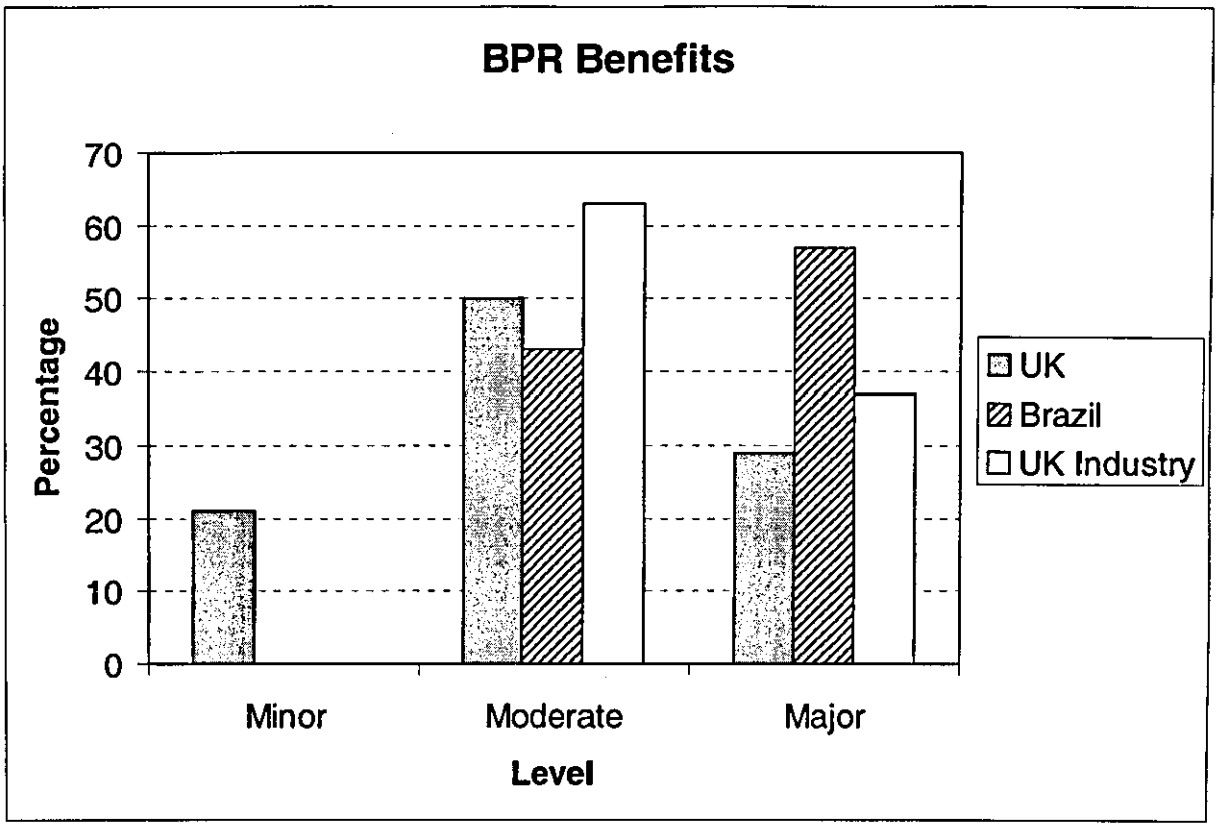


Figure 5.5 - BPR rated Benefits

It can be observed that 79% of the UK companies and 100% of the Brazilian companies and UK industry rated the benefits brought about by BPR as being moderate or major.

5.3.8 External guidance

It has been investigated whether the involved companies have hired an external consultant to help them with the BPR implementation.

It has been found that **86%** of the UK companies and **100%** of the Brazilian companies, which decided to use BPR principles, also contracted a consultant to help them. Figure 5.6 shows the distribution of consultants utilisation for those companies by each phase of the BPR process: Diagnosis, New Process Specification, Planning and New Process Implementation.

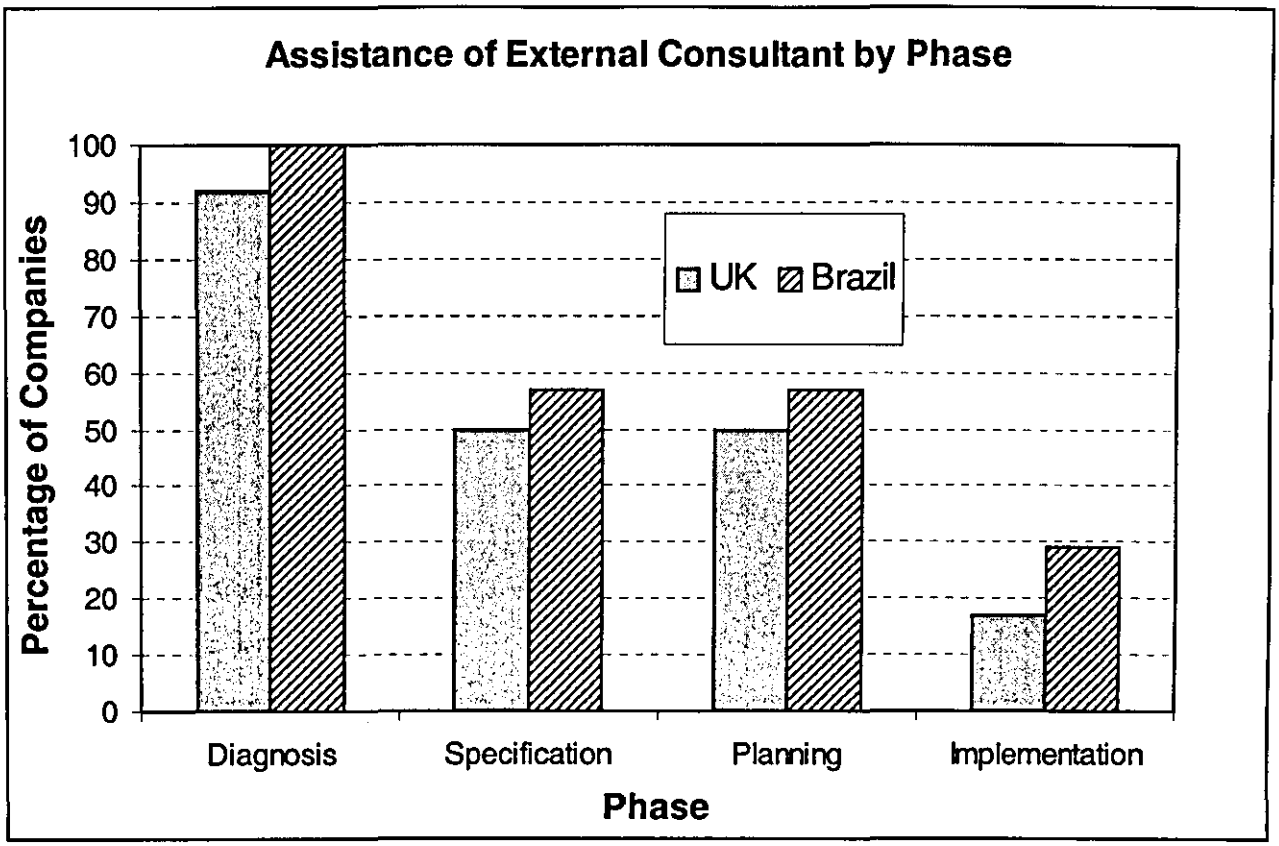


Figure 5.6 – Assistance of External Consultant by phase in the BPR

It can be observed from Figure 5.6 that almost all of the companies, which decided to hire an external consultant, gave preference to the diagnosis phase as compared to the other phases and about 50% of them still kept an external consultant during the specification and planning phases.

5.3.9 Problems during BPR

Companies were required to tick up to 3 of the biggest problems they faced during BPR. Figure 5.7 shows the most ticked ones. The reliability of such responses might be questioned, once respondents might present different interpretations (see section 8.2 – Success and limitations of the work)

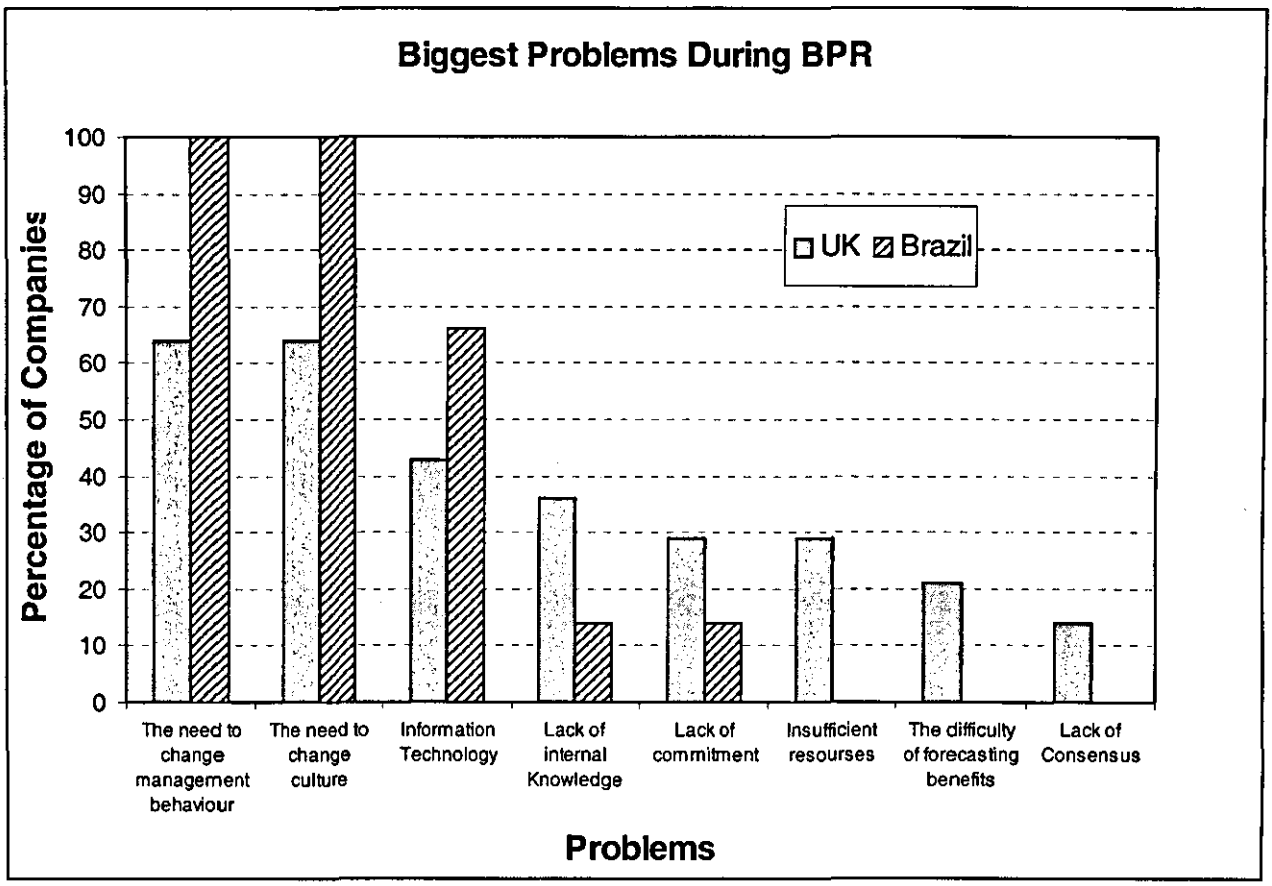


Figure 5.7 - Problems faced by companies, which used BPR principles

Therefore, it can be observed that the need to change management behaviour and the need to change culture were rated as being the biggest problems faced during BPR by 64% of the UK surveyed companies and by 100% of the Brazilian surveyed companies. The questionnaire did not specify which kind of behavioural or cultural change was being analysed. Therefore, they should be analysed in a broad sense see section 8.2 – Success and limitations of the work).

5.3.10 BPR expectations

The reality against the expectation in the BPR for three major areas has been investigated: Time frame, Benefits and Costs.

Figures 5.8, 5.9 and 5.10 show that comparison among the respondents.

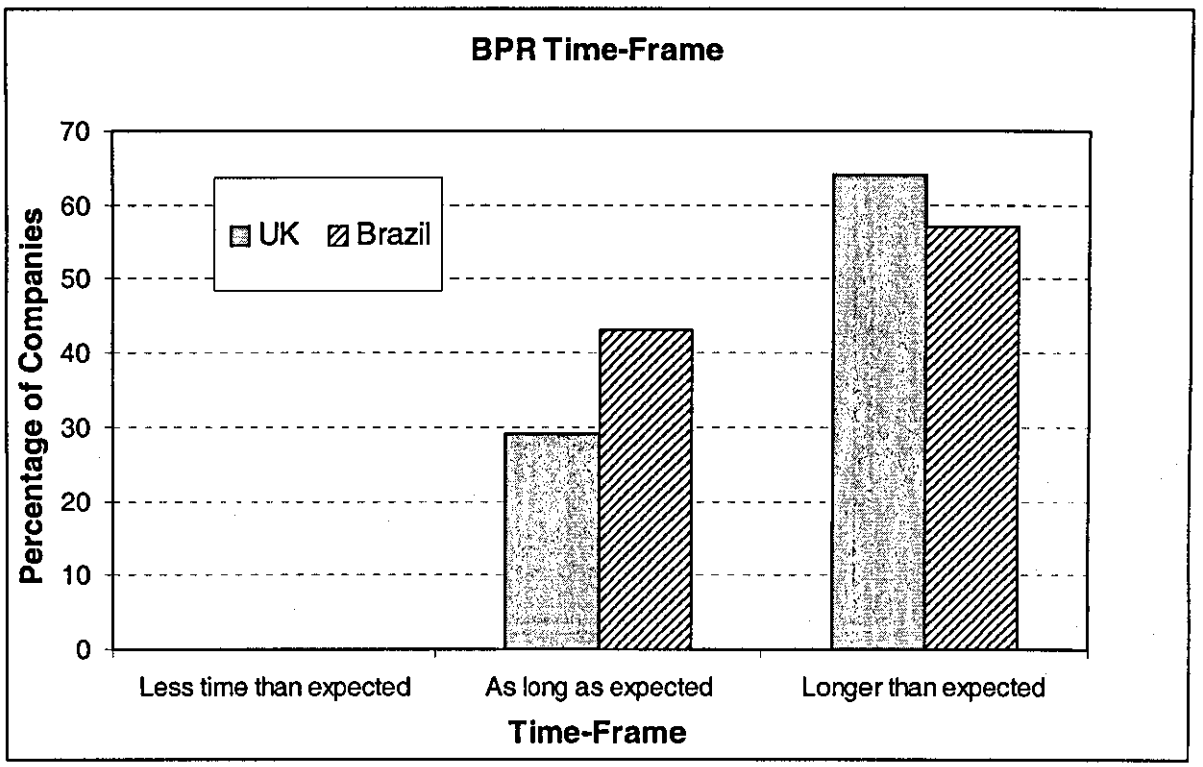


Figure 5.8 - BPR time frame: expectations against the reality

From Figure 5.8, it can be observed that 64% of the UK surveyed companies and 57% of the Brazilian Surveyed companies found that the BPR took longer than previously expected. No surveyed company answered that the BPR took less time than previously expected.

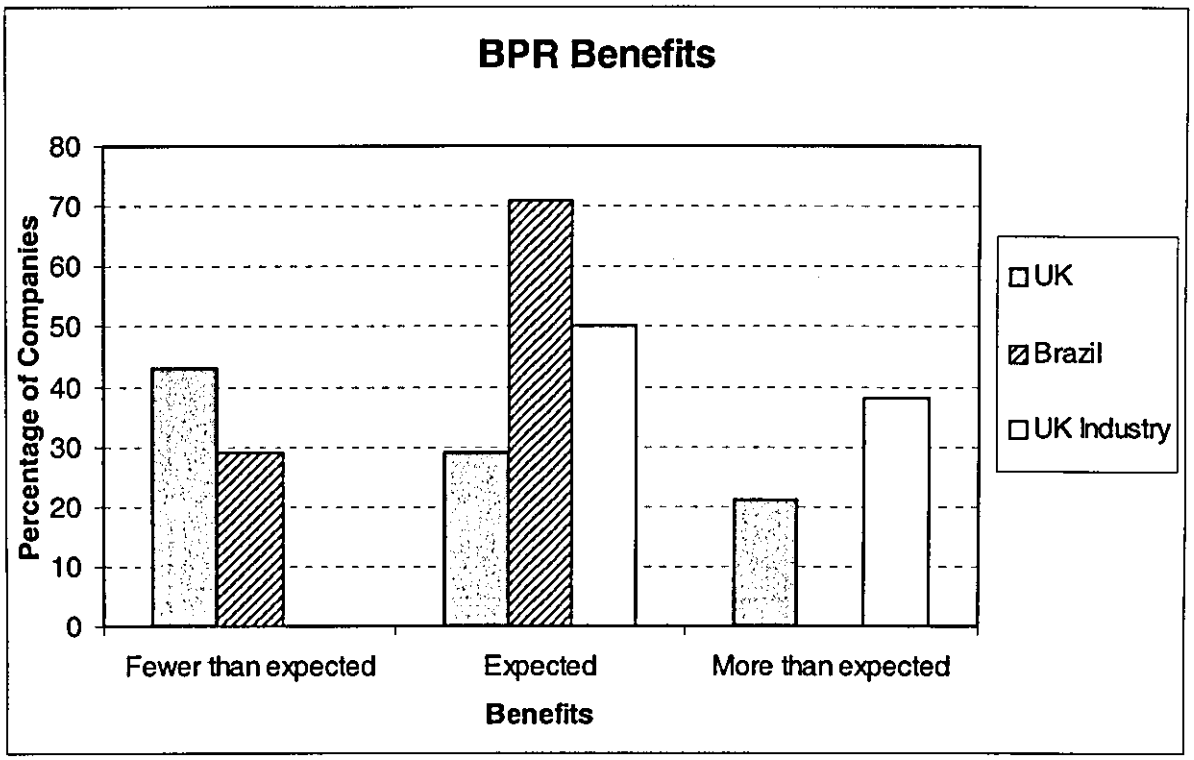


Figure 5.9 - BPR Benefits: expectations against the reality

From Figure 5.9, it can be observed that a considerable amount of the UK surveyed companies (43%) considered BPR brought less benefits than previously expected and 71% of the Brazilian surveyed companies considered BPR brought the expected benefits. The surveyed companies, for the UK industry segment, tend to find more benefits when compared with their previous expectations.

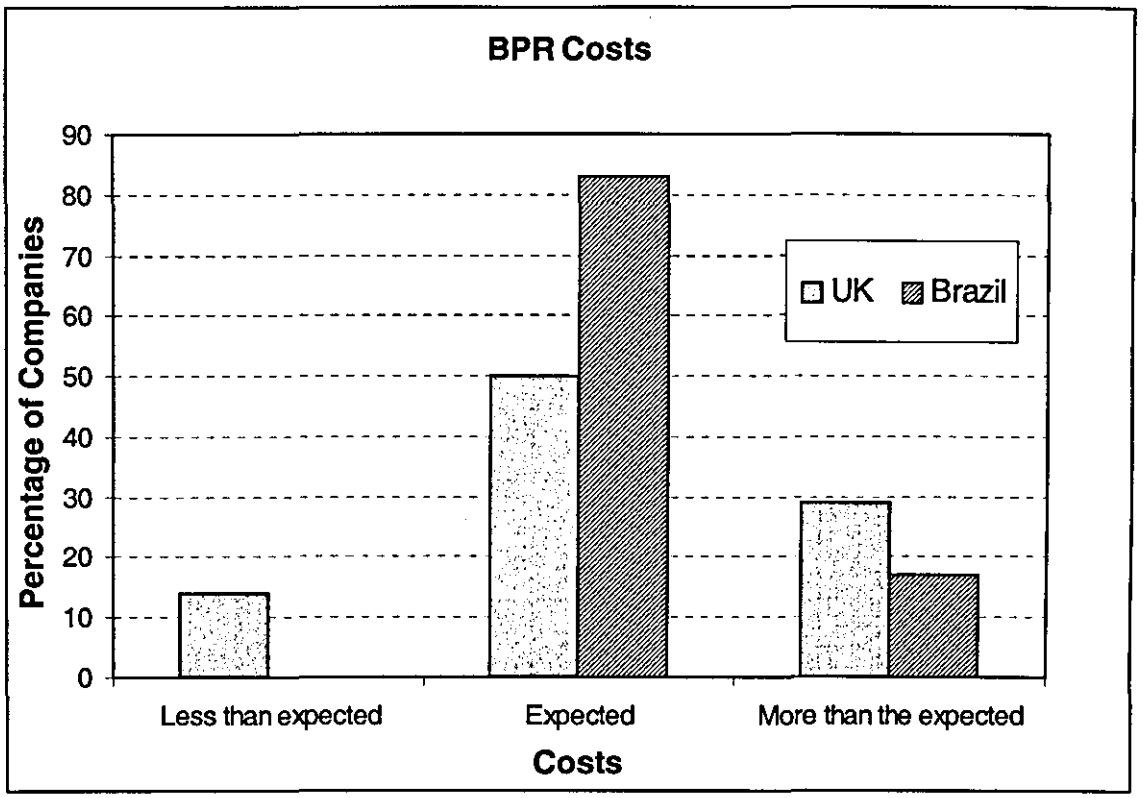


Figure 5.10 - BPR Costs: expectations against the reality

From Figure 5.10, it can be observed that 29% of the UK surveyed companies found that BPR did cost more than expected while 50% of the UK surveyed companies found BPR costs within their expectations.

On the other hand, 83% of the Brazilian surveyed companies found BPR costs within their expectations while 17% of the Brazilian surveyed companies found BPR costs to be higher than they expected.

5.4 Research Study Conclusions

5.4.1 UK and Brazilian surveyed companies profiles

The privatisation process could have contributed to the application of BPR principles in the surveyed companies. However, this relationship was not found. The UK privatisation programme presented its strongest effects in the 1980's while the Brazilian Privatisation Programme took place mainly in the 1990's. Therefore, there are some important differences between both privatisation policies, which certainly are reflected in this survey. On the other hand, the re-engineering "boom" took place at the beginning of the 1990's. Therefore, the UK privatised surveyed companies had already passed the initial stabilisation process when they decided to implement a re-engineering programme while the Brazilian surveyed companies, which decided to implement a re-engineering programme, had to run it parallel to the company stabilisation process.

In addition, all the Brazilian respondents were from the industry sector while in the UK they were from both industry and services sectors. This is consistent with the privatisation programme in both countries.

The Brazilian surveyed companies experienced more organisational changes than the UK surveyed companies in the first year following the privatisation. This could suggest more flexibility to implement a BPR programme but it was not true because the UK surveyed companies were more prone to apply BPR, as described in section 4.4.2.

Due to the significant differences between both privatisation programmes, the author decided to keep individual analysis over the results.

5.4.2 Use of BPR (Business Process Re-engineering)

UK surveyed companies:

All the companies herein surveyed were privatised prior to 1990 and 82% of them started using BPR from 1991 (21% in 1991, 7% in 1993, 43% in 1994, 22% in 1995 and 7% in 1996). Most of them (79%) started using BPR principles after 1993, which is consistent with the BPR "boom" at the beginning of the 1990's, more precisely in 1993 with the publication of the book "Re-engineering the Corporation" (Hammer, 1993).

Bashein (1994) mentioned that about 88% of large corporations are involved in BPR, which is consistent with the results described above.

Brazilian surveyed companies:

Almost all the companies herein surveyed were privatised after 1990 (94% of them were privatised from 1991). Only 39% of the Brazilian surveyed companies have started a BPR programme. This is not consistent with the Bashein (1994) conclusion described above since most of the surveyed companies are large corporations. That result (39%) might have to do with the stabilisation period required after a privatisation process. However, this may also be a reality for developing countries. The reduced number of large corporations involved in BPR in Brazil might be associated with the state owned companies only. International companies located in Brazil, might not present the same profile. Therefore, another survey is recommended to analyse the percentage of large corporations that have implemented re-engineering programmes, assessing the influence of privatisation aspects as well as the location of such companies.
From the surveyed companies that have been using BPR principles, 71% started within the 1992-1993 period.

5.4.3 Characteristics of the re-engineered processes

In spite of the reduced number of surveyed companies (39%) undertaking the BPR in Brazil, it seems that the re-engineering programmes tend to be more comprehensive than the ones undertaken in UK. Once the sample of companies that undertook BPR is very small in Brazil, some other reasons could have led to that difference, such as BPR starting date, country development status, privatisation policies, etc.
A representative number of surveyed companies (21% in the UK and 29% in Brazil) may be undertaking a re-engineering programme focused on functional processes rather than on multifunctional processes. If this is true, they should review the basic philosophy of BPR; otherwise they may be reinforcing an organisational structure (functional structure) that probably is not the most effective in terms of customer satisfaction and company efficiency.

5.4.4 Benefits of BPR

The UK surveyed companies:

Even considering that 79% of the surveyed companies that used BPR principles rated the benefits of BPR as being moderate (50%) or major (29%) (see Figure 5.5), 43% of them informed they found fewer benefits than they expected, 29% found the expected benefits, 21% found the benefits in excess of what they expected and 7% did not rate the benefits (see Figure 5.9). Therefore, it seems that the expectation of achieving results using BPR may be higher than it should be. However, the actual benefits are quite significant for 79% of the surveyed companies.

When the UK industry segment is analysed separately, it reveals that 100% of the surveyed companies that used BPR principles rated the benefits as being moderate (63%) or major (37%) (see Figure 5.5). Concerning their expectations versus reality, 50% of them informed they found the expected benefits while 38% of them informed they found more benefits than they expected.

Brazilian surveyed companies:

It was revealed that 100% of the surveyed companies that used BPR principles rated the benefits of BPR as being moderate (43%) or major (57%) (see Figure 5.5). However, 29% of them informed they found fewer benefits than the expected and 71% found the expected benefits. No one found the benefits in excess of what they expected (see Figure 5.9). Therefore, it seems that the actual benefits are quite significant for all the surveyed companies although 29% of them expected more than they found.

Hammer (1993) estimated that 50% to 70% of the organisations that undertake a re-engineering effort do not achieve the dramatic results they intended. From the above results, we may conclude that there is a differentiation between the results the organisations expected and the results they have achieved, which may explain the high rated number of BPR projects failures. In addition, those reported rates might have changed with the maturity of re-engineering around the world. Another hypothesis is that the developing countries have much more room for improvements when compared with the countries in the first world.

It can be also deduced that the most significant results are related to the industry segment, when compared with the services segments in the UK.
Therefore, a further investigation on this matter should be carried out to better assess the actual benefit of BPR and the reasons, which lead an organisation to declare that its BPR project has either failed or succeeded.

5.4.5 Organisational Change

UK surveyed companies:

Most of the surveyed companies (77%) did not implement a significant organisational change in the first year following the privatisation. Considering that most of them (82%) embarked in a BPR programme, it seems that there is no relationship between the organisational change and the decision to undertaking the BPR.

Brazilian surveyed companies:

Contrary to the UK surveyed companies, most of the Brazilian surveyed companies (69%) experienced major organisational changes in the first year following privatisation.

Further investigations on this matter could determine the relationship between organisational change and BPR, prior and after BPR implementation.

5.4.6 External Guidance

Most of the surveyed companies (86% of the UK surveyed companies and 100% of the Brazilian surveyed companies) decided to hire an external consultant to help them with the Re-engineering process. However most of them have not hired an external consultant for all the phases. Diagnosis was the preferred phase as described in Figure 5.6.
The sample was not large enough to allow any conclusions on whether surveyed companies, which hired external consultants, have achieved better results or have expected better results.

5.4.7 Problems during BPR

It has been evidenced that the most critical problems faced during BPR were related to human behaviour (behavioural problems), followed by Information Technology. Therefore, the probability of succeeding in a BPR attempt might be increased if it is preceded by a change management programme and a previous investigation on Information Technology potential contribution. The need for a change management programme is described by Hammer (1996) while the importance of Information Technology is described by Davenport (1993).

Another consequence is that radical changes might not be likely to succeed if an adequate time frame is not considered to implement them, considering the behavioural aspects. This is consistent with the results shown in Figure 5.8, where 64% of the UK surveyed companies and 57% of the Brazilian surveyed companies found that the BPR took longer than previously expected.

5.4.8 BPR costs

In spite of considering that 64% of the UK surveyed companies and 57% of Brazilian surveyed companies found that the BPR took longer than previously expected and also 64% (UK) and 100% (Brazil) faced mainly behavioural problems, only 29% of the UK respondents and 17% of Brazilian respondents considered that the BPR costs rose beyond their expectations.

Therefore, it seems most of the surveyed companies, which undertake BPR, underestimate time and behavioural problems when compared to costs.

5.4.9 UK Segments Analysis

All the responses were analysed for both industry and industry + services segments. No significant difference has been found, except with regard to the benefits of BPR, where it seems that the UK industry has found more benefits than the services segment. This result is consistent with the one found in Brazilian industries.

6. Chapter 6 - Research study number 3: The Evolution of the Case Study Company

Summary

This chapter describes the author's observations in the case study company. He compares BPR pre-conditions to succeed with the initiatives undertaken by the company as part of a comprehensive cultural transformation programme. He also reviews the evolution of the company concerning the New Product Development Process, and analyses the involved managers' contribution and knowledge evolution in the BPR endeavour.

6.1 Characteristics of the case study company:

The Brazilian Aeronautical Company (EMBRAER) was founded in 1969 and today it is an important western aeronautical company. It is based in São José dos Campos, 60 miles from the city of São Paulo and is part of an aerospace group, including:

- EDE - EMBRAER Equipment Division, based in São José dos Campos and manufactures landing gear and aeronautical equipment.
- NEIVA S/A - Based in Botucatu (State of São Paulo) which manufactures small planes under Piper license and also a plane for agricultural purposes, solely designed by EMBRAER.
- EAC - EMBRAER Aircraft Corporation, based in Fort Lauderdale, Florida (USA).
- EAI - EMBRAER Aircraft International, based in Le Bourget, France.

The group activities include the design, development, industrialisation and commercialisation of several types of turboprop and jets for civil, defence and agricultural use.

The group's total installation area is about 300.000 square meters and the number of employees is approximately 8000. The main site in São José dos Campos, has approximately 7000 employees.

6.1.1 Historical Development

In 1946 the Technological Institute of Aeronautics (ITA) was founded. In 1954 the Development and Research Institute was founded and there, the first national aeroplane named Bandeirante (EMB-110) was designed and manufactured. In 1968 the first flight of the EMB-110 took place. In order to maintain the acquired technology the Brazilian government decided to create EMBRAER in 1969.

During the following two decades, several planes were built by EMBRAER. These are described below:

EMB-110 Bandeirante: Turboprop aeroplane for 18 passengers that was sold to more than 45 companies in 36 countries achieving a total number of approximately 500 aircraft.

EMB-120 Brasília: Turboprop aeroplane for 30 passengers achieving a total number of approximately 300 delivered aircraft.

AMX: a jet fighter aeroplane developed in partnership with Italy and sold to the Brazilian and Italian Air Forces.

EMB-312 Tucano: a turboprop military trainer accepted by several Air Forces around the world. More than 600 units have been sold in 14 countries.

EMB 312H Super Tucano: This is derived from the EMB-312 Tucano and is considered to be a modern version of the original.

In 1989, EMBRAER started the most ambitious design project of its history: a commercial jet aeroplane for 50 passengers, the ERJ-145.

EMBRAER has also become supplier to important aeronautical companies, such as the former McDonell Douglas. EMBRAER produces the MD-11 outboard flap as well as some parts for 747 and 767 Boeing aircraft. Some small parts for the Boeing 777 aircraft have already been produced by EMBRAER. Another important contract was undertaken with Sikorsky to produce parts for a new helicopter.

In order to face the above challenges, the company counts on a trained staff, including approximately 1000 engineers.

In 1989 the company had about 12,000 employees. However, due to the international crisis in the aeronautical market, associated with the new Brazilian government policy, EMBRAER downsized to approximately 8,000 employees in 1990. In 1992 another downsizing reduced the number of employees to 6,000.

In December 1994 the company was privatised and downsized some months later to approximately 3800 employees. The Brazilian government retained 20% of shares and the employees, about 10% of them.

Due to its origin and the government strategy to retain Brazil's capability to design and manufacture aeroplanes, EMBRAER became highly technologically oriented. As a consequence, its Technical Department was strongly functionally orientated.

After the beginning of the aeronautical international market crisis, the management of the Technical Department was changed. This resulted in a greater preoccupation with the project management process.

6.1.2 Privatisation reasons and implications:

In 1992, the Brazilian government chose EMBRAER as one of the companies that should be privatised. Several problems delayed the process until the end of 1994.

An international crisis in the aeronautical market started around 1990 but some recovery has been seen since 1996. From 1990, the Brazilian government decided to invest in the country's infrastructure and social issues rather than in the companies it was controlling. In addition, military budgets have diminished around the world. All these factors associated with the company's internal decisions led to a financial situation that was hard to control. Therefore, privatisation seemed to be the only way to avoid the company going bankrupt.

Since 1995, the new controllers have invested in the company to allow it to achieve a profitable profile.

After privatisation, most company directors were replaced and an external consultant was hired to analyse and re-engineer company business processes under the command of a provisional president. Such an analysis led to the company downsizing mentioned before. Consequently, the Technical Department decided to change its organisational structure from heavily functional to a balanced matrix one, where Technical (or Project) Managers would theoretically have the same authority as Functional Managers. This change aimed at improving focus on the projects as well as providing a better integration among functional areas.

The administration of the company gained more flexibility and common direction after the privatisation, which allowed the achievement of financial objectives.

6.1.3 Company recovery

To improve the prospects of recovery, EMBRAER decided to concentrate its efforts on the most important product in terms of company revenue for the next few years: the ERJ-145 aeroplane. At the same time, investments in technological development were considered to be essential to prepare the company to face this highly competitive market. Therefore, EMBRAER needed a technological updating without compromising the predicted schedule for the ERJ-145 certification and industrialisation processes.

The certification of the ERJ-145 was a great success. The certification cycle time was reduced by 40% of the originally predicted time to comply with market needs, and the plane has been very well accepted on the market due to its intrinsic quality and low operational cost.

The company also announced a new jet for 37 passengers (the EMB-135), which is derived from the ERJ-145 and, therefore, was presented in a short time to market. This new aeroplane has also been widely accepted on the market. More recently EMBRAER launched a new family of commercial jet aeroplanes, for 70, 98 and 108 passengers, named the Embraer 170 and the Embraer 190.

6.1.4 The need to re-structure

In order to change from a technology oriented company to a business oriented company, many actions had to be taken. First, the leadership of a strong president was essential to guide the policy change. Secondly, recently promoted directors were very motivated to follow the president's instructions. Besides that, the employees were afraid to loose their jobs due to the company's poor financial state and recent downsizing. Therefore, in the author's opinion, there was no significant resistance to the proposed structural changes. These structural changes were essential to allow the recovery of the company. Basically the sales and financial teams were reinforced while the production and engineering teams were given very aggressive targets to be attained.

6.1.5 The role of the author in the company

The author started working for the company in 1983, just after his graduation in electrical engineering. From that time until 1994 he operated in the electrical systems

area, being responsible for the AC electrical systems for all EMBRAER aeroplanes. He had the function of supervisor of a group of engineers and technicians.

From July 1995 until October 1997 he worked at EMBRAER as a Technology Development Manager, being responsible for the development of new technologies and supporting the re-structuring of the Technical Department. From October 1997, the author has been working as a Program Manager, being responsible for the structuring of a new Programs Directory department, which manages all Programs (projects) of the company.

Due to his function since 1995 and also due to his contribution to new trends in the organisational aspects, the author has participated and assumed some responsibility for most of the activities related to the company re-organisation associated with the new product development process. Details of this participation and responsibility are as follows:

- October 1995: Benchmark on Integrated Product Development (IPD) in Aerospace companies: The author was the leader of an EMBRAER team composed of 5 people that visited 11 companies to exchange ideas on IPD.
- March 1996: Alignment of high level management objectives until December/98: The author participated in a special Organisational Programme involving the president of the company, vice-presidents, directors and senior managers to make decisions about the objectives to be achieved by the end of 1998. The author influenced decisions concerning company processes re-engineering, new product development strategy, and also the decision to reinforce the team culture within the company.
- July 1996: The author was appointed to conduct the re-engineering effort related to the Product Development Process.
- September 1996: The author was the leader of a team in charge of implementing IPD concepts in the company
- August 1997: The author participated in several discussions and prepared a set of slides (presented by the technical director to the President), which led to the decision to have a new department. This department would design and conduct all programs in the industrial area.
- October 1997: The author was invited to organise the operation of the new Programs Department.

- December 1997: The author was chosen as the Program Department representative in a major company re-engineering programme named Transformation of the Organisation for Results (TOR).
- June 1998: Participation in a Benchmark on Program (Project) management with four USA leading aerospace manufacturer companies.
- March 1999: The author was invited to be responsible for all processes and programs integration efforts within the industrial area, supporting the industrial vice-president.

All the facts listed above have given the author the opportunity to compare what the research community says about BPR with what the day-to-day operation of a company may achieve in this respect.

6.1.6 The company BPR targets

EMBRAER was privatised in December 1994. At this time company debt was approximately US$340 million with a turnover of about US$ 300 million. Therefore, a very intense re-structuring was needed for the company's survival.

The financial target was to finish the year of 1996 with a debt of US$ 40 million and to finish the financial year of 1997 with some profit.

The board of directors decided to revise the core business processes of the company. The New Product Development process was chosen and its re-engineering (BPR) started in mid 1996 in this scenario. An IBM consulting group was hired to conduct the BPR endeavour and one Director was assigned as the leader of that work. The BPR diagnosis phase took from July 1996 to September 1996. The diagnosis results revealed that the company had to review some of its processes.

The board of directors, which was under pressure for short-term results, was not completely in agreement with the diagnosis results. In March 1997, after the end of the ERJ-145 aeroplane certification process, it was decided to give the go-ahead for the BPR conception phase. However, it was accepted that BPR would reveal significant results only by the end of 1997.

As a result, the consultant group carried out a top down analysis, i.e., from the whole company process to specific processes. At the end of the conception phase in June 1997, the board of directors decided which company processes would be deployed, taking into

account the envisaged time span to get the predicted results. This decision was based on the following premises:

- The sales and marketing areas were under structural revision at a time of intensive sales activity. Those areas, therefore, would not have their processes re-engineered.
- The production area achieved some technological improvements and these seemed to be adequate for the work envisaged.
- Customer support was suffering severe criticisms from the clients mainly concerning the price and accuracy of the replacement parts. Besides that, customer support was seen as a potential reinforcement to the sales campaign. This was taken as a reason for going ahead with re-engineering. The material chain was not satisfactory and it was concluded that some changes would save a lot of money in a very short time. Therefore, the decision was to re-engineer the supply chain process.
- The engineering area needed improving to guarantee future projects within the new market timeframe constraints. Again, the decision was to re-engineer the product development process.

The above rationale, based on the functional area performance, indicates that the functional culture was still present in a very strong way and the consultant group was not able to change this scenario.

Based on this scenario, the following processes were chosen to be re-engineered:

- Material management
- Product Support
- Product Development

The author became responsible for the re-engineering of the Product Development Process (PDP). The PDP was undertaken in a cross-functional environment.

The support of the board of directors for the BPR efforts did not occur as expected. This may be credited to the decision to implement a new enterprise software system named ERP (Enterprise Resource Planning). The director who was in charge of the BPR endeavour also became responsible for the ERP implementation and he decided that most of the company processes should follow the available ERP processes. This resulted in a substantial discontinuity to the work that was required for selected processes.

In October 1997 the author moved to another area and left the leadership of the re-engineering of the PDP. The PDP work was continued under a new leadership.

The company scenario changed from 1996 to 1998 due to the huge volume of sales that occurred during 1997. Therefore, the biggest priorities became the production and material chains, and multi-project management.

6.2 Introduction

The case study company (Embraer) was considered by the author as a "laboratory" to test his hypothesis. Literature survey and research studies number 1, 2, and 3 revealed that the main obstacle when re-engineering a complex product development process in post privatisation companies is related to managerial behaviour and cultural change.
The case study company was privatised in December 1994; it has a very complex product development process, which has been re-engineered with success. The author decided to investigate whether the case study company evolved concerning a set of pre-conditions to succeeded in a re-engineering endeavour. Several actions (initiatives) were undertaken by the case study company in order to transform the company to a more business/process oriented approach after its privatisation. The author participated of such actions and observed their relationship with the BPR pre-conditions to succeed. The author poses that a set of actions, which improve the managerial knowledge concerning the BPR pre-conditions to succeed, will increase the probability of success of a re-engineering endeavour. The same approach might be used by any company, which has been privatised and decided to re-engineer a complex product development process.

6.3 Research objective:

To investigate the evolution of the case study company for the re-engineering of the New Product Development process, observing the influence and evolution of the managerial knowledge and behaviour related to the BPR pre-conditions to succeed.

6.4 Selected research methods:

Semi-structured observation, internal surveys, semi-structured interview, documentary research. (See definitions of design methods in section 2.8).

6.5 Research methods - selection justification:

The researcher fully participated in the re-engineering of the new product development process at the case study company, influencing most of the undertaken actions. However, he did not identify himself, to his colleagues, as a researcher. His studies at Loughborough University, associated with his functions at the company (technology development manager and programs integration manager), has allowed him to establish a two directions approach: (1) he brought (to the company) the most advanced concepts concerning product development process and (2) at the same time, he oriented his research based on the experiences and observations he was having in the case study company.

Therefore, the selection of the observation method allowed him to analyse the evolution of the case study company, comparing it with the results of the literature survey, interviews and surveys carried out with many other companies. The observation was semi-structured to allow enough freedom to generate the hypotheses as well as to generate ideas for the elaboration of several internal and external surveys. On the other hand, the learning process with the thesis preparation enabled the author to implement several actions in the company and to observe their evolution against the predicted theoretical results. The main target was to observe the case study company evolution against the chosen pre-conditions to succeed in a re-engineering effort.

In order to give more reliability to the results, the author carried out some internal surveys and interviews, which could confirm some key points of his observations.

6.6 Sample identification:

The Case Study Company was chosen because it could represent well a company, which develops complex products. The new product development process was chosen to evaluate the re-engineering effort and analyse the influence of a managerial behaviour transformation that was ongoing due to company privatisation.

6.7 Desired participant profile:

Considering that the main target was to investigate managerial behaviour during the re-engineering of the new product development process, the observations were mainly based on the leaders' perception of the company evolution. Therefore the chosen participant profile was related to anyone who had a function as a leader involved in the product development process.

6.8 Data collection method:

The author registered the main occurrences in the company related to the new product development process in order to compare them to the top ten BPR pre-conditions to succeed, according to his opinion. Data were also gathered through questionnaires and interviews.

6.9 Research conduct:

The author investigated the evolution of the new product development process in the case study company, influencing most of the undertaken actions. Throughout this process the author registered the main occurrences, comparing them with the expected results.

Some surveys were carried out involving the leaders involved with the new product development process.

An interview with several managers was also conducted to evaluate the evolution of the BPR pre-conditions at the case study company.

6.10 Research timeframe:

The research started in June 1995 and was concluded in March 1999

6.11 Research structure:

The author compared the actions recommended by the re-engineering research community with the actions undertaken by the case study company. The author also selected the top ten items that could contribute to a re-engineering effort and systematically analysed them against the main action undertaken by the case study company.

Three surveys identified how the leaders reacted to the implemented changes and an interview revealed the evolutionary profile of the top ten items selected by the author.

The surveys were elaborated with multi-choice questions and the respondent was not identified.

6.11.1 Comparison between EMBRAER BPR pre-conditions and research community recommendations

The decision to implement a BPR programme was initiated in the first quarter of 1996, when the directors and managers agreed upon objectives and results to be achieved by the end of 1998. The author participated in those meetings and influenced decisively the decision to undertake a BPR programme. At that time, the following statement was accepted: "EMBRAER will have its business processes re-engineered by December 1998"

The president of EMBRAER was committed to the BPR programme and assigned the Director of Organisational Development to conduct it. The president stated he would be leading the programme with a committee composed of the vice-presidents. Therefore, a strong leadership was established to start the BPR programme.

If one compares EMBRAER's initiatives with what the research community says should be done (described in the section 2), the following results would be found at that time (June 1996), when an official BPR programme started at EMBRAER:

Research community	EMBRAER
Cultural and behavioral aspects	
Hofsted (1994) categorizes culture as follows (see section 2.2): • Process oriented x result oriented • Employee oriented vs. job oriented	Embraer, in the author's point of view, is result oriented, job oriented, professional, closed system, loose control, and pragmatic.
• Parochial vs. professional • Open system vs. closed system • Loose control vs. tight control • Normative vs. pragmatic	
Drucker (1992) says that culture – no matter how defined – is singularly persistent. In fact changing behaviour works only if it is based on the existing "culture"	About one year after its privatisation, Embraer elaborated a joint strategic planning for a further 5 years. All management staff participated of this effort and many activities were developed to understand and respect the existing culture.
According to Schein (1985) culture operates one level below climate, values or corporate philosophy	A comprehensive cultural change programme, involving all management level was set starting in March 1996. Very deep discussions were taken, identifying the root causes of problems.
Kolb et al. (1995) say that the most effective way to change behaviour is put people in a new organisational context, which imposes new roles, responsibilities, and relationship on them	Company privatisation brought a new organisational scheme and correspondent alterations in roles and responsibilities
Miller (1999) observes that today's managers must learn to manage the emotional climate of their organizations with some proficiency they manage tasks and resources.	Since company privatisation, the new role of managers demanded an intensive training in management techniques (managers used to be very technology oriented).
Sharkey (1999) stated that research directly linking leadership development to cultural change has been limited	Leadership development has been a top priority of the company's president.
Gebelein (2001) says that new partnerships, strategic alliances, customer bases, market demands, distribution channels, technology, and competitive threats all demand that we anticipate change, adapt almost instantly, and manage it effectively	Embraer learned very much from partnerships in both military and commercial business areas. The projects strategies have been evolving in a fast pace.

Senge et al. (1999) suggest that leaders should specially focus on understanding the limiting processes that could slow or arrest change. According to him, most serious change initiatives eventually come up against issues embedded in our prevailing system of management. Jackson and Humble (1994) conclude that middle managers will continue to play a vital role in an organisation even considering that the number of middle managers tends to diminish within an organisation. "Instead of being channels of communication and control, they will become conduits of changes and challenge. They will remain because their new role as coach, change agent and entrepreneurs rather than bureaucrat is essential to the organisation they serve.	As mentioned before, a comprehensive cultural change programme, involving all management level was set starting in March 1996. Very deep discussions were taken, identifying the root causes of problems. Embraer has been implementing a comprehensive managers development programme where the role and responsibility of the leadership is very related to their ability to deal with people, influencing them as coaches, entrepreneurs and change agents
Business Process Re-engineering (BPR)	
Davenport (1993): • BPR must be undertaken by design teams or task forces • BPR can be well supported by the information technology	EMBRAER started with a core-team composed of the leading director and one manager from each company department (the author was the manager for the engineering department) The board of directors decided to heavily invest in Information Technology, based on BPR recommendations
Hammer and Stanton (1995): (top ten most common **ways of failing at Re-engineering):** • Don't re-engineer but say that you are.	In 1995 the company had used the word "re-engineering" for a downsizing initiative. Therefore, this Programme was named Processes re-drawing to avoid any resistance to the word "re-engineering".

• Don't focus on process.	The IBM consultant group was hired to guide the work, focused on processes.
• Spend a lot of time analysing the current situation.	The current situation was analysed in a few weeks
• Proceed without strong executive leadership.	A committee composed of the president and vice-presidents led the project
• Be timid in redesign.	All company processes were considered and three of the eight processes were chosen to be re-engineered
• Go directly from conceptual design to implementation.	There was a detailing phase before the implementation
• Re-engineer slowly.	Significant results were expected within 9 months after starting the re-engineering work.
• Place some aspects of the business off-limits.	All areas of the company were embraced by this project
• Adopt a conventional implementation style.	It was the first time a project like that had all vice-presidents and the president as leaders
• Ignore the concerns of your people.	A change management programme was in place, involving approximately 300 employees, before starting BPR.
Bashein et al. (1994):	
Obstacles:	
• Lack of commitment and leadership	OK, as above
• Unrealistic scope and expectations	The expected results were not realistic due to the short time required to get the return on investment
• Resistance to change	A change management programme was in place at that time
Positive preconditions for BPR:	
• Senior management and sponsorship	OK, as above
• Realistic expectation	Not realistic results, as above
• Empowered and collaborative workers	Empowerment was given
• Strategic context of growth and expansion	At the time the BPR programme started, the internal scenario of the company was not positive.
• Shared vision	A common vision had just been established by directors and managers at that time
• Sound management process	The management process was the weakest point of the organisation
• Appropriate people working full time	Appropriate people were chosen but not working on a full time basis
• Sufficient budget	Budget was allocated, as necessary

Product Development Strategies	
According to Michelletti (1994) CE is a "strategic concept, leading to the systematic approach of the integration of design, production and related processes dealing with all aspects of the product life cycle (included manufacturability, assemblability and reparability considered at the earlier phases of the design process)".	Embraer started to use concurrent engineering in late 1980's. The results of such strategy were very positive. The ERJ 145 aircraft family is an example of that, because it used concurrent engineering and it has been a successful product.
McGrath et al., (1992) developed a product design method called Product and Cycle Time Excellence (PACE) which can be understood as an Integrated Product Development approach	Embraer has been implementing an integrated product development philosophy, which is based on McGrath's concepts.

Table 6.1: Comparison between Research Community statements and EMBRAER environment prior to BPR

From the above table, it can be seen that EMBRAER fulfilled most of the pre-conditions needed to succeed in a re-engineering programme. However, two aspects of the company's approach did not comply with normally accepted views. These were:

- The unrealistic expectation about BPR results within 9 months;
- the cost-cutting focus.

Besides that, at that time, the company's internal scenario was not positive and the management process was the weakest point of the organisation.

6.11.2 The BPR and product development evolution at EMBRAER

6.11.2.1 BPR:

In spite of starting an official BPR programme at EMBRAER in 1996, a great effort to transform the company's processes started in September 1995, when the shareholders assigned a new president. From that time the company started changing its culture from highly technological oriented to highly business oriented. This cultural transformation significantly affected all the company's processes.

6.11.2.2 Product development process

The product development process had already evolved prior to the privatisation of the company, in December 1994. However, it was not a systemic evolution because there was no shared vision about that and no top-level guideline to orient the people involved. After the benchmark with aerospace companies, which took place in November 1995, the product development process followed a systemic evolution, taking into account the international trends for this process.

6.11.3 The combined evolution of BPR and product development process

Based on his literature survey and his benchmark with 16 British companies and 11 American companies, the author selected the top ten factors, which would contribute the most to the success of a BPR endeavour for new complex product development process. Then, he observed the case study company evolution against those factors to evaluate the contribution of each action to the BPR.

The top ten BPR pre-conditions to succeed at the case study company are listed as follows:

- Organisational structure changes;
- Alignment around a common vision;
- Team culture;
- Integration among functional areas;
- Commitment from the middle and high level management;
- Motivation;
- External guidance;
- Clearly stated desired targets;
- Individual valorisation;
- Resources availability.

The author limited his investigation to the product development process, since he was given the task of implementing the BPR actions for this process.

Tables 6.2 shows the relationship between the top ten BPR pre-conditions to succeed and the actions undertaken by EMBRAER. The author made a subjective classification (H= High, M= Medium, L= Low) for the contribution of each undertaken action (initiative) to the managerial knowledge of BPR pre-conditions to succeed.

Some managerial actions take place annually (as the internal action plan) and others present a duration period. In order to simplify the analysis the author attributed the same grade either for a repetitive action or for an action, which is related to a period. Therefore, the grade "L, M, or H" applies to all actions described in the table heading.

The three letters classification (L, M H) was chosen to represent the extremes of contribution and a medium contribution. Considering the analysis is broad and generic, the author understood there was no need for defining a more accurate grade scale.

Sections 6.12.1 and 6.12.2 describe each item of the table and section 6.12.3 draw some conclusions from the same table.

Table 6.2 - Relationship between pre-conditions to succeed in BPR and actions undertaken by EMBRAER

Undertaken action / **BPR pre-conditions**	Organisational structure change July-1995	Team culture July/1995 December 1998	Benchmark Aerospace Companies Nov-1995 June 1998	Internal Action Plan 1996 1997 1998	Change management March 96 April 1998	Re-engineering June 96 Dec 97	ERP implementation Nov 97 December 98	Organisational structure change January-1998
Organisational Structure	H	M	H	L	H	M	L	H
Shared vision	M	M	H	H	H	M	M	H
Team Culture	M	H	M	M	M	M	H	H
Integration among functional areas	H	H	L	H	H	H	H	H
Managers commitment	H	M	M	H	H	M	M	H
Motivation	M	H	M	M	H	L	M	M
External guidance	L	H	L	L	H	H	H	L
Results/Targets	M	M	L	H	M	H	H	H
Individual Reward	L	H	L	H	H	L	M	L
Resources	L	M	L	L	H	H	H	L

H= High contribution M= Medium contribution L= Low contribution

6.12 Results

The results herein described are based on the analysis of the activities described in table 6 rows and columns.

6.12.1 Summary of each Major Actions undertaken by EMBRAER:

6.12.1.1 Organisational structure change (July 1995):

The engineering department started its change from a functional organisation to a matrix organisation in 1990 (see description of matrix organisation in section 2.5). However, only after 1995 (right after the company privatisation) the matrix organisation was officially implemented. The managers responsible for each Program were named Technical Managers while the managers responsible for the functions (or technologies) were named Functional Managers. The operation of the matrix organisation was preceded by an intense discussion with involved managers about their roles in the new organisation. The matrix did not operate, at the beginning, as a balanced one mainly due to the following reasons:

- A jet aeroplane was under development, demanding more than 50% of the available manpower, and under a very short time frame schedule. Besides that, the success of this plane was taken as the only way to allow company survival.
- The people involved received no training to act as required
- Lack of required skill and experience of several key people to account for relevant product development issues
- Lack of design process formalisation.

In spite of that, the new organisational structure revealed itself to be better than the previous one and, even with the scarce manpower, the achieved results for each program were satisfactory (the author observed that all performance parameters of each program were better controlled by having dedicated program managers), which probably would not have occurred if the former organisational structure had been kept.

Proof of that came in November 1995, four months after the new organisational structure took place, when an internal survey was carried out by the author. The objective of that survey was to check whether the leadership perceived the organisational change as an improvement. The research method was a 1-page questionnaire with one multiple choice question and open fields for comments about improvements, problems as well as suggestions to correct the identified problems related to the new organisational structure. The multiple choice question presented three alternatives related to the new organisational structure: improved, kept the same and was worse.

All managerial leadership of the technical department was involved (20 functional managers, 7 technical managers and 20 team leaders). The response rate was 72%.

This survey revealed that 69% of the functional managers, 100% of the technical managers and 85% of the team leaders found the new organisational structure brought improvements while 19% of the functional managers and 8% of the team leaders understood that there was no alteration due to the new organisational structure. The main improvements mentioned in the open questions were: better integration, better focus in the program management, better control, reduction of work overload for functional managers. On the other hand, the main problems mentioned were: reduced number of employees to accomplish the tasks, work overload, conflicts of priority between programs, more than "one boss" for operational team.

The author carried out another internal survey at the beginning of 1997 to analyse the acceptance of matrix organisation after 18 months following its implementation. 586 employees from the technical department participated in this survey. The employee's response rate was about 62% and manager's response rate was about 34%.

A very simple questionnaire with multiple-choice questions was prepared to evaluate the organisational climate of the technical department. Two questions were considered relevant to the aim of the thesis: the adequacy of matrix organisation to individual activities and the contribution of matrix organisation to integrate functional areas. As mentioned above, there were project and functional managers in the matrix organisation. The employees of the technical department were assigned to one or more projects and they had to report either to project managers or functional managers.

Managers and employees responses were analysed separately once their roles in the organisation were quite different.

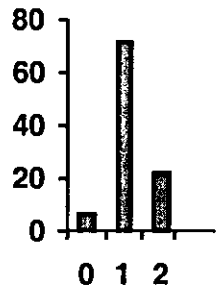
Figure 6.1 and figure 6.3 show managers response to the following questions respectively: 1) Is the matrix organisation adequate to your activities? 2) Does the matrix organisation contribute to the integration among functional areas?. Figures 6.2 and 6.4 show employees response to the same questions. Both questions are very generic and intend to analyse, in a broad sense, whether the managers and employees were in favour of the matrix organisation.

Table 6.2 describes the relationship of this action (organisational structure change) with the BPR pre-conditions to succeed. In the author's point of view, this action has highly contributed to the managers' consciousness about organisational structure, integration amongst functional areas and commitment with company's goals. Organisational aspects were deeply discussed, increasing the managers knowledge on that and contributing to have well informed managers who became more prepared to contribute to the re-engineering of the product development process.

The following figures show the survey obtained results:

Organisational structure (Employees' response):

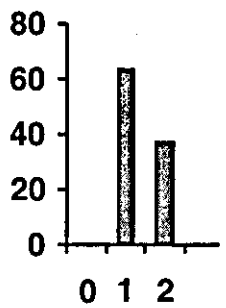
Is the matrix organisation adequate to your activities?



0 – No response 1 – Yes 2 – No

Figure 6.1: Employees' opinion about the adequacy of the matrix organisation

It can be observed that 75% of the employees considered the matrix organisation as being adequate to their activities.



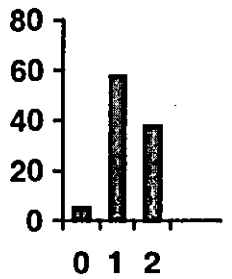
Organisational structure (Managers' response):

0 – No response 1 – Yes 2 – No

Figure 6.2: Managers' opinion about the adequacy of the matrix organisation

It can be observed that 60% of the managers considered the matrix organisation as being adequate to their activities

Does the matrix organisation contribute to the integration among functional areas?

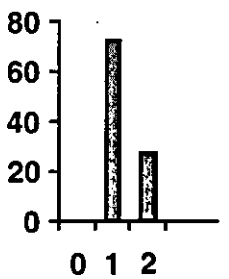


Employees' response:

0 – No response 1 – Yes 2 – No

Figure 6.3: Employees' opinion about the contribution of the matrix organisation to integration among functional areas

It can be observed that 60% of the employees considered that the matrix organisation contributes to the integration amongst functional areas.



Managers' response:

0 – No response 1 – Yes 2 – No

Figure 6.4: Employees' opinion about the contribution of the matrix organisation to integration among functional areas

It can be observed that 75% of the managers considered that the matrix organisation contributes to the integration amongst functional areas.

From the above graphs, it can be noticed that most of the managers (about 75%) perceived a great benefit to the integration of the functional areas. However, approximately 60% of them understood the matrix organísation was adequate to their activities. This response may be an indication that they considered the matrix organisation more adequate than the functional organisation (as revealed in the previous survey in November 1995) due to the better integration among the functional areas. However, as the matrix organisation demands more managerial negotiation, it might be reflected by the lower rate (60%) for the adequacy of the activities.

On the other hand, approximately 75% of the operational employees perceived the matrix organisation as being adequate for their activities and only approximately 60% of them were convinced about the contribution of the matrix organisation to the functional area integration.

It can be noticed that managers and employees responses presented the same profile, i.e., they were in favour of the new organisation. This is an indication of shared vision about the organisation, what can be considered as a positive result of the change management programme carried out by the company.

It shall be also pointed out that a survey described by Wright et. al. (1995) – the author was part of the group who carried out this survey - about the use of design methods in the UK industry, revealed that 100% of the surveyed companies that had core-teams structure and 80% of the surveyed companies that had a matrix management structure had a graduated engineers/employees ratio larger than 0.10.

Should we assume that a more complex product is associated with a greater proportion of graduated engineers, it may indicate that a more complex product (ratio > 0.10) requires a more integrated organisational structure than the functional one to obtain the desired product quality within the necessary timeframe.

The above results demonstrate the adequacy of the matrix organisation and its benefits to the integration among functional areas in the Technical Department of EMBRAER. All this is consistent with the fact that the privatised Brazilian surveyed companies experience a significant organisational change right after privatisation.

Main problems faced during the organisational transformation: The author perceived the following key problems during the effort to implement a matrix organisation in the technical department:

- In the beginning, several functional managers offered some resistance to the proposed change. The author observed, based on some conversation with the managers that were offering more resistance, that the main cause was because they were afraid of losing contact with daily product development activities, and knowledge of the product and, consequently, of losing administrative influence in the company. The author invited most of them to take part in the re-engineering of the product development process, which gave them the opportunity to expose their knowledge and to exchange ideas with other managers that were not against the organisational change, which contributed to better understanding of the proposed organisational structure and product development process.

Once the functional managers were very connected to the daily activities of the product development, it was very difficult for them to understand their new role (process and people oriented). Most of the managers were engaged in post graduation training, related to business management, which contributed in making them understand the new organisational trends for companies which develop complex products. This action contributed very much in decreasing the resistance to the proposed change.

- The program managers did not have enough preparation for the function they were assigned to. Therefore, they took a considerable amount of time to gain respect from the other managers and to feel confident to take certain decisions.
- Technical Leaders were assigned to support the Technical Managers. However they did not receive any training concerning the "modus operandi" of the new organisation, which brought several operational problems.
- The company did not have enough people with the required knowledge to work as Technical Leader or Technical Manager.

6.12.1.2 Organisational structure change (January 1998):

The matrix organisational structure of the engineering department (implemented in July 1995) proved to be successful. On the other hand, during 1997, the company sales increased significantly. Therefore, several projects (programs) had to be run simultaneously. In order to comply with this new challenge, the company board of directors decided to extend the engineering organisational structure to the industrial vice presidency. For this purpose a new department named Programs Department was created in January 1998 and started operating in a matrix approach with the functional areas within the industrial vice-presidency (engineering, production and supply).

It shall be pointed out that such organisational structure change affected many more managers than the previous one (carried out in 1995). This was because it was applicable to 4 departments rather than just one. Besides, the experience accumulated in the technical department allowed an infrastructure preparation much more comprehensive than the previous one. The team culture had been established in the company and the president and vice-presidents had a good expectation and demanded clear results from that. Table 6 reflects that because the author considered this change as being of high contribution to managerial knowledge about organisational structure, shared vision, team culture, integration amongst functional areas managers commitment and company results. Several directors and managers were involved in deep discussions about the mentioned change, which contributed very much to increase the knowledge about this subject.

Approximately 8 months later, the author carried out a survey to identify the evolution of the new organisational structure. The intention was to verify the evolution of the new organisation in terms of integration of functional areas, projects (programs) cost track, project schedules and quality of the solutions.

A multiple-choice questionnaire was sent to the involved leaders (directors, senior managers, managers and team leaders) asking them to compare the previous organisation with the new one with regards to the topics described above. The respondent was not identified (only the category he belonged to was identified). From 130 respondents, 4 were directors, 23 were senior managers, 34 were managers and 69 were team leaders.

They could choose the following alternatives:

-It is much worse (the new organisation is much worse than the previous one)
-It is worse (the new organisation is worse than the previous one)
-It is the same (the new organisation is the same as the previous one)
-It is better (the new organisation is better than the previous one)
-It is much better (the new organisation is much better than the previous one)
-I do not know (the person did not feel comfortable to compare both organisations

Figures 6.5 to 6.8 show the results of this survey.

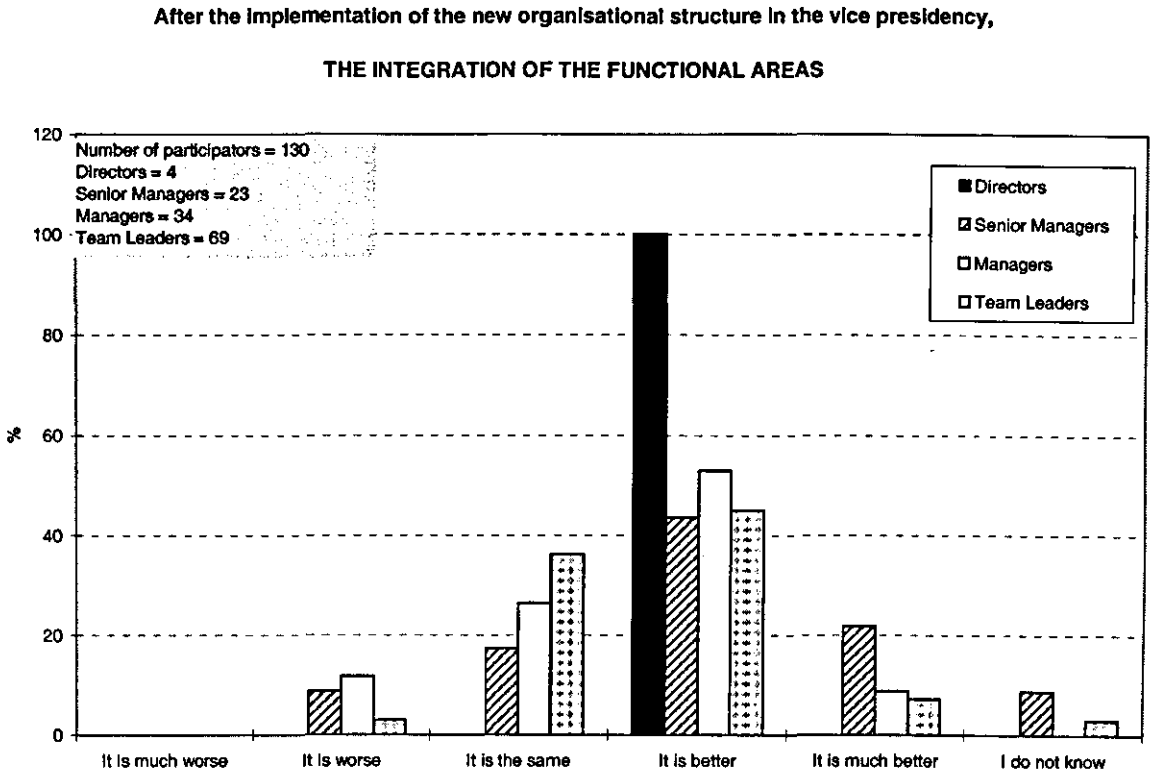


Figure 6.5: The integration of the functional areas after the implementation of a matrix organisation in the vice-presidency

All the directors found the new organisational structure better than the previous one in terms of integration of the functional areas. 40% of the senior managers found it better, 20% much better and only 10% found it worse than before. The managers presented about the same profile of senior managers. More than 40% of the team leaders found it better, and more than 35% of them found it to be the same as the previous one.

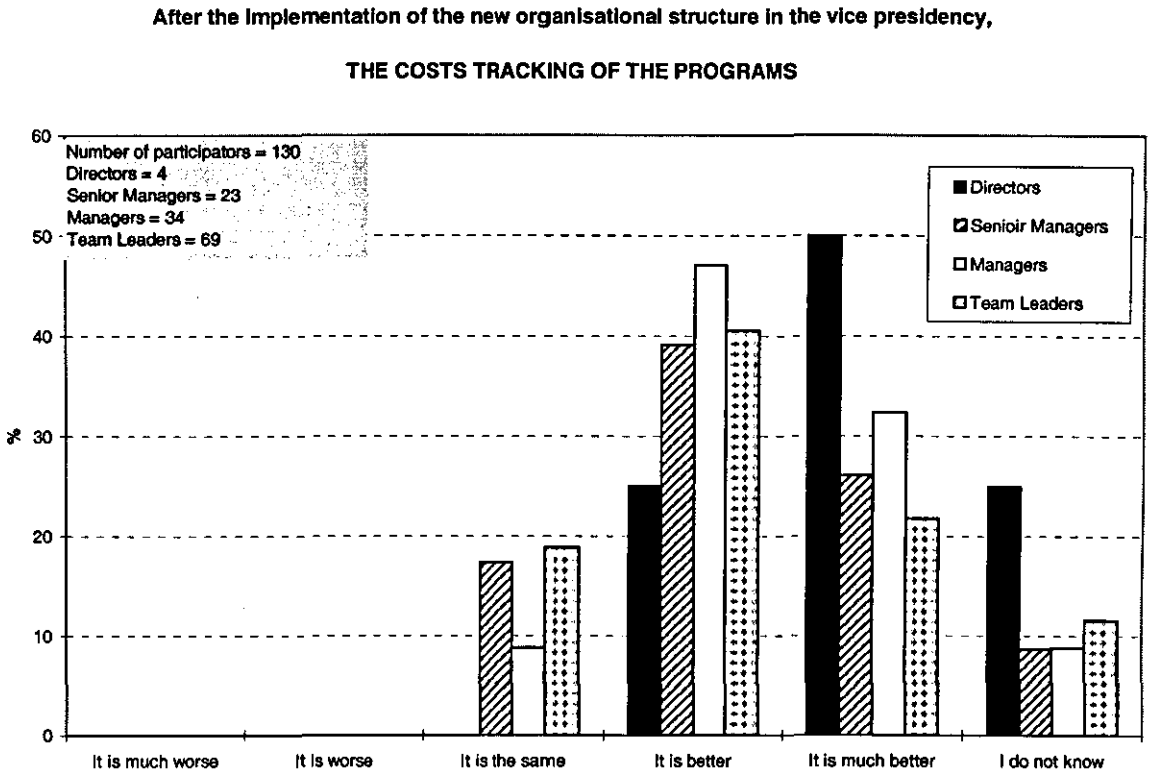


Figure 6.6: The cost track of the programs after the implementation of a matrix organisation in the vice-presidency

50% of the directors found the new organisation to be much better than the previous one. 25% of them found it to be better than the previous one and 25% did not feel comfortable to evaluate. Less than 20% of the senior managers found it to be the same as the previous one. 65% of the senior managers found it to be better or much better than before. About the same profile is valid for the managers and team leaders.

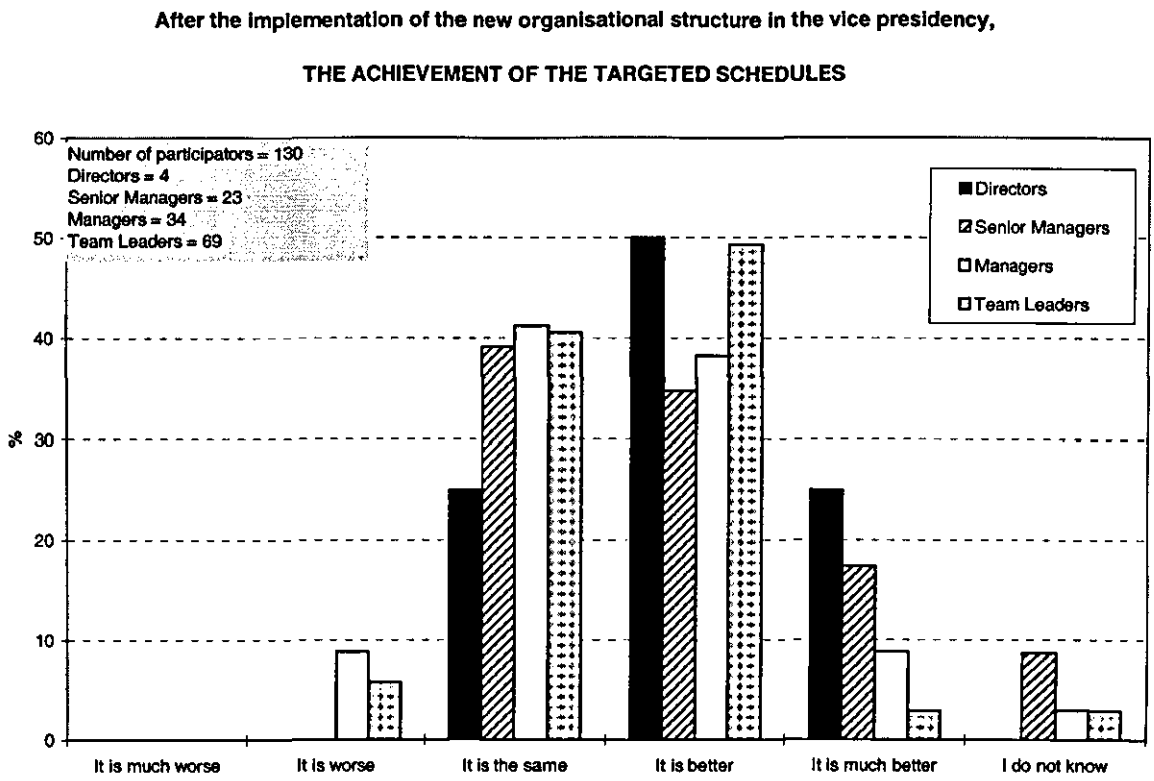


Figure 6.7: The achievement of the targeted schedule after the implementation of a matrix organisation in the vice-presidency

50% of the directors found the new organisation to be better than the previous one concerning targeted schedule. 25% found it to be much better and 25% found it to be the same as the previous one. About 40% of the senior managers found it to be the same as the previous one. 35% found it to be better and less than 20% found it to be much better than the previous one. Almost 50% of the team leaders found it to be better than the previous one and 40% found it to be the same as the previous one.

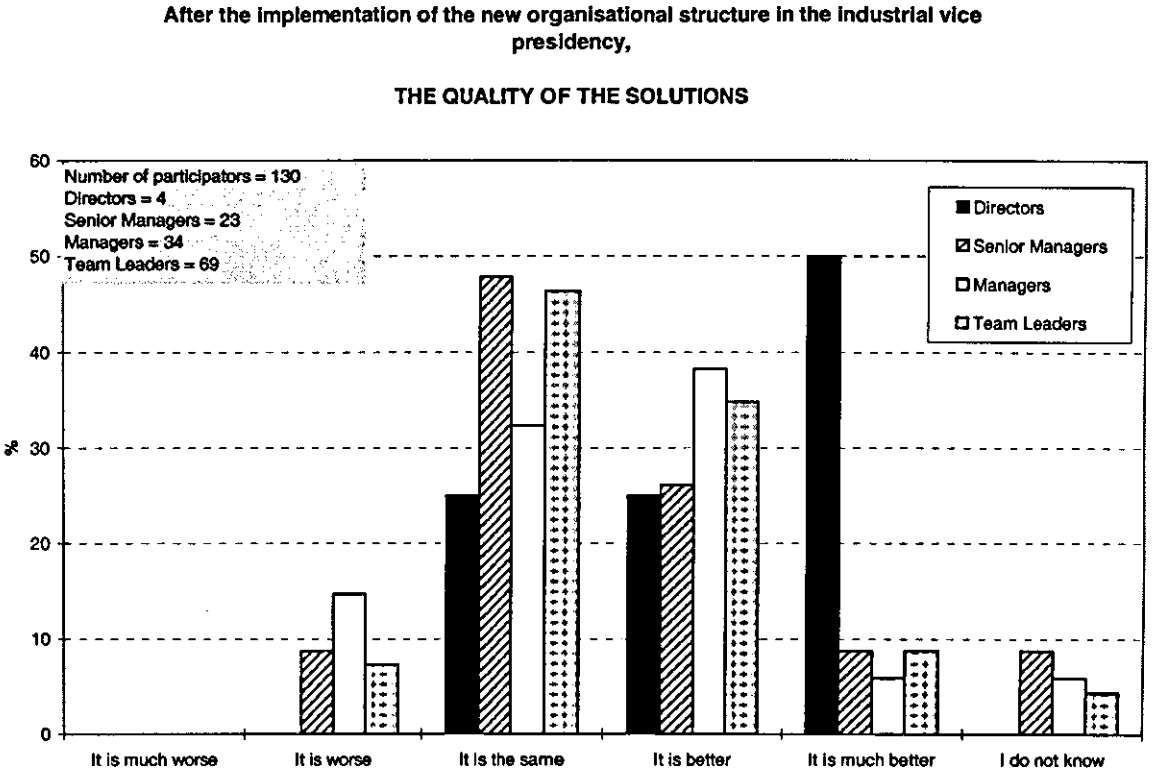


Figure 6.8: The quality of the solutions after the implementation of a matrix organisation in the vice-presidency

50% of the directors found the new organisation to be much better than the previous one, 25% found it to be better and 25% found it to be the same as the previous one. Almost 50% of the senior managers found it to be the same, 25% better, less than 10% much better and less than 10% found it to be worse than the previous one.

The graphs described above indicate that the leaders of the industrial vice presidency considered that the integration of the functional areas and the costs tracking of the programs presented a very significant improvement due to the matrix organisation. Besides that, they considered there was no impact to the schedule and quality of the activities and they indicated even an improvement of these topics. The coherence of the responses from the leaders (directors, senior managers, managers and team leaders) indicated that they shared the same positive vision concerning the new organisational structure. This is an indication that the infrastructure of the change was well communicated to the leaders. It is also a demonstration of the very low level of resistance to the proposed organisational transformation.

Main problems faced during the organisational transformation: The author perceived the following key problems during the effort to implement a matrix organisation in the industrial vice presidency:

- The nature of the functional areas (engineering, production and supply) was considerably different from one another and the new programs department had to define the degree of integration with each of them. In order to minimise integration problems, some workshops were carried out between the programs department and each of the functional departments. In these workshops the basic operational guidelines were established.
- Some areas outside the industrial vice presidency, such as the commercial and financial areas, also offered some resistance in the beginning and workshops were also carried out to define the basic operational rules.
- The programs department was also very new and the program managers did not have enough experience and adequate supporting staff to carry out their jobs as expected. It took about 6 months to have a more adequate organisation for all programs.

The role of the author:

1995 organisational structure change: The author, in conjunction with two managers, wrote the guidelines to the operation of the matrix organisation, describing the role and responsibilities of each function as well as the matrix "modus operandi" inside the technical department. The author conducted several meetings with the involved leaders to discuss the new organisational structure. The author was also assigned as a Technical Manager, responsible for a technology development programme, which, besides the development of new technologies, also included the department organisational evolution, and a direct support to the technical director. The author also elaborated and undertook the organisational structure surveys, mentioned above. The author also elaborated several presentations related to the structural organisation, including the presentation to the president of the company, which proposed the extension of the matrix organisation to the industrial vice presidency. Therefore the author was a full participant of the transformation process and indicated, based on the above observations, that the involvement of senior managers with a change, as described before, and their adequate preparation (knowledge improvement) seem to be key factors of success in a change process. This is completely in accordance with the hypothesis herein tested.

1998 organisational structure change: The author participated in several meetings with the board of directors to discuss the expansion of the matrix organisation from the engineering department to the industrial vice presidency, involving the engineering, production and supply departments. The author wrote the guidelines to the operation of the matrix organisation, describing the role and responsibilities of each function as well as the matrix "modus operandi" inside the industrial vice presidency. A new department was created and named Programs department. The author was assigned as a Program Manager, responsible for the integration of existing programs and the consolidation of the organisational transformation, as well as a direct support to the Programs director.

6.12.1.3 Team culture:

Several team-building initiatives took place since July 1995. The author hired a consultant company named ARETE since March 1996 to give training to some multi-functional teams.

The following paragraphs describe a summary of the author's observations of facts that happened at EMBRAER for the first teams, built during its reorganisation process. All descriptions, when applicable, are standardised in classes, as follows:

Origin: It describes some important factors that led to the team building decision.

Team Building: It describes how the management environment behind the team building strategy was

People gathering: It describes how people were chosen to build the team

Training approach: It describes how training, if any, was organised.

Team impression: It describes team members' views of the whole process

Middle Managers impression: It describes the middle management impression about team building.

Higher-level management impression: It describes the high-level management impression about team building and expected results.

Team achievements: It describes the results (positive and negative) achieved by the team

Main pitfalls: It describes the main pitfalls along the team trajectory

It shall be observed that all the above topics are fulfilled with author's observations. Therefore, they reflect the author's perspective based on observations, conversations and personal involvement.

Aircraft Fuel Tank Team

Type of Team: permanent, self managing (specialists were co-located under the leadership of a technical manager to carry out the design of a fuel tank to a helicopter, which would take more than 3 years)

Origin (July 1995): A contract with a helicopter manufacturer to design and produce the helicopter fuel tank led two directors to come to a decision of working in a true Concurrent Engineering environment. The entire design adopted the Integrated Product Development philosophy.

Team Building (July 1995): A group of experts were sent to the contracting company for two months to understand all the requirements and to start some applicable preliminary studies. A Team leader was chosen to organise the entire task.

People gathering (July/September 1995): Besides the experts which were sent to the contracting company, some other people were requested from functional areas and co-located to work as a team.

Training approach: No Team training activity was performed until March 1997. After training in team culture in May 1997, the efficiency of this team increased very much.

Main pitfalls in the author's perspective: There was no significant infrastructure for the operation of this team. They were co-located and they received the resources they needed. However, they were not supported by the company, as they should have been. As a consequence, they created their own rules and "modus operandi".

DFMA Team

(DFMA is a Trade Mark from Boothroyd and Dewhurst Inc and stands for Design for Manufacture and Assembly)

Type of Team: work team, to test a new methodology (some specialists were assigned to perform a specific work and evaluate possible new applications)

Origin (December 1995): As a conclusion of a Benchmarking on Integrated Product Development philosophy, the company board of directors approved the investment in the DFMA (Design for Manufacture and Assembly) strategy.

Team Building (January/February 1996): A DFMA North American consultant was contracted to run a one-week DFMA workshop at EMBRAER. Based on this consultant's guidelines, there were analysed two aeroplane components. The middle managers involved in this matter were requested to collaborate by providing people for the workshop, as required.

People gathering (January 1996): Experts associated to the chosen case studies were chosen from functional areas.

Training approach: A two-hour meeting with the selected team's members was arranged to explain what the DFMA philosophy was about (based on previous contacts with consultants/surveyed companies and internal studies). There was no team culture training.

Main pitfalls in the author's perspective: The lack of adequate teams culture training caused serious problems for the team operation. As a consequence, the DFMA results were not as good as expected.

Trade Studies Team

Type of Team: Creative, self managing (specialist from several discipline were co-located to find out new alternatives to reduce an aircraft manufacturing costs)

Origin (October/December 1995): As part of a consultant's conclusion on how to improve the competitiveness of an EMBRAER aeroplane, the creation of a team to evaluate possible alternatives to reduce the amount of man power needed to produce that aeroplane was recommended.

Team Building (March/1996): The middle management related to the subject (including the author) produced a document proposing the mission, objectives, strategies and targets for a team to be built. A rough economical analysis was carried out as well.

Some discussions involving the tools and techniques to be used by the team took place at that time. All of the people involved agreed on the use of DFMA (Design for Manufacture and Assembly Tool) as a workshop had just revealed its potential benefits. On the other hand, not everybody agreed on a dedicate team training, since it would require some extra money from the available budget to run the team.

At the end of the day, the company directors involved accepted the investment proposal, as a whole.

People gathering (March/96): The line production manager, responsible for the final aircraft assembly line, was requested to bring about all identified opportunities that would lead to a man power reduction during the aeroplane assembly process. Based on those opportunities and associated technologies, people were chosen by the associated functional management areas.

Training approach (March/96): A request for a proposal was written and distributed to 8 Brazilian consulting companies. Three were interviewed and one was chosen.

Team culture training was carried out followed by training on some methodologies, including DFMA.

Team impression: At the end of the training period, team members started to question whether they would be capable of complying with the established targets. They discussed a lot what should be their approach towards target accomplishment and, by using the methodologies learnt during the training period, they decided the way to organise themselves to face the challenges.

In spite of the challenge they were very excited about this new way of working, as it was the first time they were responsible for the entire problem (including a specified budget).

The training period was considered essential by most of the team members. The training evaluation was extremely positive.

Middle Managers impression: A manager has decided to become the person responsible for the team results and to report the results to his director. The same manager would also be responsible for the team infrastructure (a place to work, microcomputers, etc.).

The agreed monthly follow up meeting between the team and managers involved did not occur for a period of three months, as the manager responsible for team results did not consider it essential.

After this period, the first follow up meeting occurred and revealed several team problems, caused basically by a lack of infrastructure and communication inside and outside the team.

Higher-level management impression: Higher-level management was poorly informed about team results and therefore they were not happy with the team performance, as perceived by the author during a conversation with involved directors.

Team achievements: Team member's commitment to the target was very high and very good results started to appear in spite of the infrastructure problems. At the end of the agreed one-year period the team had achieved all milestones they had negotiated with the managers involved.

Main pitfalls in the author's perspective:

- To build a team without a minimum required infrastructure.
- A functional manager (outside the team) responsible for team results.
- Poor communication within and outside the team.
- Lack of empowerment to the team
- Target not well defined.

Training Aircraft Team

Type of Team: Permanent, work team (specialists were assigned, under the leadership of a technical manager, to carry out the development of a derivative aircraft)

Origin: An upgrade of two existent prototypes, followed by a predicted series production batch of 100 aircraft, led some directors to create a team-based structure for the aircraft development phase. The project began in July 1995.

Team Building: The Technical and Production Departments had organised themselves into a matrix organisational structure (between projects and functional areas). Program leaders were designated to work with people that would come from functional areas. The aircraft team was not co-located, i.e.; the engaged people would still remain in their functional areas. Most of them would divide their available time with some other projects.

People gathering: The required people were identified and designated by their functional managers.

Training approach: team culture training was carried out for part of the team in September 1996, followed by training on some methodologies, including DFMA.

Team impression: The people involved did not consider themselves as a team. The Team Culture Training occurred more than one year after team building and they were surprised because they did not have the consciousness of their mission as a team.

Middle Managers impression: Managers have allocated people to work on this program on an "availability" basis, i.e., their working period should be divided with a more important program.

Higher-level management impression: High-level management considered the adopted approach as a significant evolution towards concurrent engineering, as noticed during author's conversations with involved directors.

Team achievements: The team struggled to achieve some results, as expertise availability was a constant problem. Targets had to be postponed several times mainly due to lack of manpower.

Main pitfalls in the author's perspective:

- Decision to build a team and not let them know they were a team
- Lack of minimum required resources (manpower, equipment, etc).
- Poor communication within and outside of the team.
- Undeclared expected project targets.

The Team of Teams

Type of Team: to recommend actions, self-managing (several people were assigned to this team to develop actions to disseminate team culture within the company areas)

The benchmark with Aerospace companies undertaken in November 1995 revealed that most of them were investing considerably in a "Teaming" approach. The achieved results were presented to more than 300 people inside EMBRAER, mainly during the work for change management and company strategic planning. As a consequence, a team was settled (the author was included only at the beginning) to discuss the strategies of implementing a teambuilding culture at EMBRAER.

The Team of Teams was formed in August 1996 with representatives of the most significant areas of the company concerning the Integrated Product Development philosophy. They re-selected the same consultant company mentioned above and they were trained to comply with the mission of supporting the introduction of the team-building culture in the company. They established their mission and started making presentations about teambuilding characteristics to several management and operational levels. In a relatively short time, the main concepts of teambuilding were spread throughout the company and several teams started to be trained. The pitfalls and resistance, described before, were drastically reduced. Most of the managers were convinced about the importance of team training.

From March 1996 until December 1998 more than 80 teams had received formal training, ensuring, and the team culture propagation inside the company.

The role of the author: The author was responsible for the selection of the consultant, which brought to the company the team building methodology. He also supported the operation of at least 20 teams, including the ones described above.

Main problems faced during the team culture implementation: The main problems were associated with the managerial behaviour because many of the managers did not understand the importance of teambuilding training and they took a very long time to engage their staff in official teambuilding training. This conclusion was taken based on conversation with the members of "the team of teams".

6.12.1.4 Benchmark on Aerospace companies:

Section 4 of this document describes the main conclusions of visits to several aerospace companies to investigate the evolution of the Integrated Product Development philosophy. The benchmarks motivated the directors to take the new proposed approaches to the product development process. The results of this benchmarking were spread throughout the company.

The role of the author: The author was assigned to lead a multi-functional team to the benchmark occurred in 1995 and he made many presentations about the results of the benchmarking. The author also organised and participated in the team, which undertook the second benchmark in June 1998. The Programs Director led this last benchmark.

Main problems related to the benchmarking: During the first benchmark (1995) the hierarchical level of the team should have been higher than it was in order to better influence the company's directors. In spite of that a very good communication about the benchmark results occurred because several presentations were done to almost all the leaders of the company. In the second benchmark (1998) the team was composed of one director and three managers. However, all of them were from the same department. The communication of the results of this benchmark was very poor. There was no presentation about the gathered data.

6.12.1.5 Internal Action Plan:

This is a methodology for strategic planning adopted in the company since early 1996. The most important targets and results are described for each manager and director in his area, integrated with the president's Action Plan. The president's Action Plan, related to 1996 and 1997, required a re-engineering effort to the product development process in order to make it compatible with the Integrated Product Development philosophy. Therefore, all the directors and managers involved should follow this directive, which contributes significantly to the progress of the product development process re-engineering.

The role of the author: The author supported the writing process of his director's action plan and also wrote his own action plan. Both action plans clearly planned the improvements of the product development process.

Main problems related to the Action Plan: The directors and managers of the company took a long time to realise how powerful the action plan could be as a planning tool. They started using it just as a registration of their strategies to the following years. No follow up was done at that time. It took about 3 years for the action plan to become a planning tool for all senior managers of the company.

6.12.1.6 Change Management Programme:

A change management programme, involving most of the leaders in the company (approximately 300 people) started in March 1996, involving all of the directors and most of the managers. At that time, all the relevant questions were discussed and a common vision was established until December 1998.

A consulting company named ANTAR was hired to support the preparation of the Strategic Plan for 1997. The President, Vice-Presidents, Directors and Managers were involved in some full day meetings to agree on a common target desired by the company, up to the end of 1998. In this first phase, 50 people were involved, including the author. The most relevant topics were selected and for each of them a team was assigned to achieve the desired results.

The second phase started in July 1996 and involved about 250 people with the aim of creating projects that would support such a company vision. It involved several company leaders having the Directors as "the guardian" for each group of 50 people, also giving them management orientation and support. The author became the "Leader" of the Integrated Product Development Team.

The third phase would involve about 400 employees to execute the selected projects. Some of the projects were effectively executed.

The Action Programmes for 1997 included those projects as the way to lead the company to the envisioned pattern by the end of 1998.

During the sections of projects creation, the author presented the results of the November 1995 Benchmark carried out with first class Aerospace Companies (research study number 1 described in section 3 of this report) to every participant.

The role of the author: The author influenced the directors to include, in the company vision statement, the BPR, the team culture and the new concepts for product development. The author was also the leader of the Product Development Team.

Main problems related to the change management programme: Most of the managers were not confident in this programme due to previous experiences with similar initiatives. Several changes occurred in the company as a direct result of the discussions taken in the working groups created during the change management process. However, it is very easy to forget the environment they had prior to this programme and, therefore, its contribution to the company might have been misperceived.

6.12.1.7 Re-engineering:

The IBM consulting group was selected in June 1996 to support the re-engineering of the company processes. Some of the corporate processes were deployed. One of them was the Product Development process.

The re-engineering programme started with a diagnosis phase that ended in September 1996. During this phase all the directors involved were interviewed and the "as is" process was depicted. The second phase (specification of the new process) started in March 1997. The planning and implementation phases started in July 1997 and September 1997, respectively. . At that time the major concern of the company was related to the need to increase the production rate. Therefore, from 15 teams that were assigned in the planning phase of the product development process, only 5 of them were chosen to proceed with the work. In December 1997, the consulting group was not required to continue and a new process re-engineering front started with the selection and implementation of enterprise software called ERP (Enterprise Resource Planning). In spite of that, the concept of all sub-process was drawn up and a document was written summarising all the sub-processes.

The role of the author: The author was assigned as the leader of the product development process. He ensured the revision of the product development process. He also ensured that the information acquired during the benchmark with aerospace surveyed companies was available to all teams that re-engineered the product development process. In October 1997 the author changed his position to help the creation of a new area, which would be responsible for all programs management and another person, who gave continuity to the work done, replaced him.

Main problems related to BPR: Some of the directors did not participate in this programme, as they should have, which resulted in a low management engagement in some areas. Besides that, the board of directors required a cost cutting focus and a short time result from this programme, which was not compatible with the re-engineering needs. Therefore, the elaboration and registration of the new company business processes was considerably affected. In spite of that the process culture was implemented in the company.

ERP (Enterprise Resource Planning) implementation:

Corporate software named ERP was chosen to support most of the operations in the company. A consulting group was chosen to support ERP implementation.

The ERP implementation requires processes re-engineering. However, they have to be adapted to ERP characteristics. The implementation of ERP corroborated the change management programme because it demands managerial involvement to ensure an adequate re-engineering of company processes.

The leader of the ERP Programme was the same person who was leading the re-engineering programme. Therefore, the results of the previous effort were considered during the ERP programme. However, a misleading path was chosen for ERP, i. e, it was considered that the software would solve all company problems. Several problems occurred as a consequence of this approach and the leader of the programme was replaced and a new path was considered. The decision to change the path took some time and caused delay to the re-engineering processes.

However, in the meantime, several short-term urgent projects were conducted to allow the company to increase its production rate and also to manage all the programmes simultaneously with an adequate focus.
The product development process is not completely covered by any ERP software. Therefore, it kept being re-engineered, although it did not receive a top priority inside the company.

The role of the author: The author transferred all the information to the new leader of the product development process once he was assigned to another task, which was the integration of all company programs. So, the author was assigned as the leader of the Program management process. This process is completely integrated with the product development process. This way, the author still kept strong connection with the product development process.

Main problems related to ERP implementation: The wrong focus at the beginning of this programme, as described above, and its concurrence with the re-engineering programme led the company to experience a delay in the transformation of its processes.

6.12.2 Evolution of the topics under analysis (BPR pre-conditions to succeed):

Organisational structure:

The organisational structure evolved for several years before the re-engineering took place. The actions, which mostly contributed to this, were:

- The decision to make the matrix organisation official, which required a great interaction between all managers.
- The Benchmark on the aerospace surveyed companies, which demonstrated the organisational evolution of the companies visited and
- The change management programme, which contributed to the managers' integration as well as the acceptance of a new management model.

Therefore, before starting the re-engineering, the management level was prepared to accept new ideas.

Shared vision:

All of the actions emphasised the need for facing the business aspects of the company rather than the technological aspects. All of them contributed very much to a common vision amongst the management staff. Everyone knew exactly the most important drives of the Company path to recovery. The actions that contributed the most were the Benchmark on aerospace companies, Internal Action Plan and the Change Management Programme.

Team culture:

The team culture was present in some way in all established actions. However, the consultant job was essential to implement the team culture in the company on a solid basis. From March 1996 until December 1998 more than 80 teams were trained to operate as a team.

Integration amongst functional areas:

Most of the actions generated a considerable integration amongst the functional areas involved. However the action that contributed most was the alteration of the organisational structure from functional to matrix oriented.

Managers commitment:

The strategic planning of the company established a method to elaborate and check the action plan for the next five years. This method was the most important contributing factor of managers' commitment to the main actions established by the company.

Motivation:

The actions, which highly contributed to the motivation of the people involved, were "team culture" and the "Change Management Programme". In addition, when the company started to show a clear recovery path, the motivation of each individual increased considerably.

External guidance: the case study company hired several consultant groups during the last three years. All of them helped considerably to highlight the importance of a given endeavour. However, only a few of them brought an excellent contribution to the day-to-day activities.

Results/Targets: The targets established by the company leadership were very aggressive. However, most of them were achieved. As a result, the company changed from a debt of approximately US$ 300 million at the end of 1995 to a debt of 40 million in 1996 and a debt of 13 million in 1997. From 1998 on, the company presented a significant profit and it is predicted to be very profitable in the following years. Therefore, this amazing recovery within about three years is extremely positive and shows the good results from the established targets and administrative actions.

Individual reward: The new company administration established an open communication channel based on the truth of the facts and everyone could be rewarded by his own achieved results. A programme named Participation in the Profit and Results (PPR) was implemented in the company. Great value was given to the teamwork approach.

Resources: The shareholders invested a considerable amount of money in the recovery of the company. All of the important investments, adequately presented, were approved.

6.12.3 Weighted analysis

The author decided to make a numerical analysis of table 6.2, which relates BPR pre-conditions to succeed with Embraer undertaken actions. The author related the subjective classification (High, Medium, Low) to a 1 to 5 scale in order to perform a numerical analysis of the contribution of the company towards the knowledge growth of the of managerial level. :

H= High contribution – weight=5

M= Medium contribution – weight = 3

L= Low contribution – weight = 1

Table 6.3 indicates the total grade for each factor, reflecting the author observations and judgement about the influence of the undertaken actions on the BPR pre-condition factors.

It can be observed that all the BPR pre-condition factors received a considerable contribution from the undertaken actions. Therefore the author expected a considerable evolution for each factor.

It is the author perception that the change management programme was a key factor for the success of the re-engineering efforts (grade 46) because it prepared all leaders of the company to have more flexibility and to think "out of the circle", i.e., to accept new perspectives. This is consistent with the fact that the change management programme addressed directly the cultural transformation of the company.

In order to compare the author's perception and the managers' perception about the evolution of the BPR pre-conditions, the author carried out interviews with several managers, based on the guideline described in table 8. It describes the BPR pre-conditions and it allows a comparison, for each factor, at two different periods: July 1995 (when the efforts to transform the company started) and December 1998 (when the company achieved good results). The last row of the table gives an indication of business processes evolution in the perception of managers.

Table 6.3 – Weighted relationship between pre-conditions to succeed in BPR and actions undertaken by EMBRAER

Undertaken action / BPR pre-conditions	1.Organisational structure change July-1995	2.Team culture July/1995 December 1998	3.Benchmark Aerospace Companies Nov-1995 June 1998	4.Internal Action Plan 1996 1997 1998	5.Change management March 96 April 1998	6.Re-engineering June 96 Dec 97	7.ERP implementation Nov 97 December 98	8.Organisational structure change January-1998	Grade
Organisational Structure	H	M	H	L	H	M	L	H	28
Shared vision	M	M	H	H	H	M	M	H	32
Team Culture	M	H	M	M	M	M	H	H	30
Integration among functional areas	H	H	L	H	H	H	H	H	36
Managers commitment	H	M	M	H	H	M	M	H	32
Motivation	M	H	M	M	H	L	M	M	26
External guidance	L	H	L	L	H	H	H	L	24
Results/Targets	M	M	L	H	M	H	H	H	30
Individual Reward	L	H	L	H	H	L	M	L	22
Resources	L	M	L	L	H	H	H	L	26
Grade	30	40	24	38	46	28	38	36	NA

H= High contribution = 5 M= Medium contribution = 3 L= Low contribution = 1

Table 6.4 – Interview guideline for analysis of BPR pre-conditions evolution at the case study company

Evolution rate / BPR pre-conditions	July 1995	December 1998
Organisational Structure		
Shared vision		
Team Culture		
Integration among functional areas		
Managers commitment		
Motivation		
External guidance		
Results/Targets		
Individual Reward		
Resources		
Managerial behaviour		
Business Processes		

This table was used as a guideline for an interview with several managers who were associated with the product development process. The objective was to compare their perspective concerning the evolution of BPR pre-conditions to succeed with the author analysis described in table 6.3.

The interviewed managers were required to classify each of the items in two distinct periods of Embraer transformation: July 1995 (when the first transformation action started, with the adoption of a matrix$_{6\text{-}76}$ organisation in the engineering department) and December 1998 (when all the other initiatives, described in table 6.3, had already

been applied). If the transformation programme were effective, as reported by the author in his analysis, the managers would indicate a considerable evolution between both periods, which would demonstrate they had acquired a good knowledge about BPR pre-conditions to succeed.

The author has adopted the following classification as a reference for the interviewed managers, considering the product development process:

0 = Bad (the company presents no infrastructure concerning the topic under analysis)

5 = Regular (the company does an average work concerning the topic under analysis)

10 = Excellent (the company is outstanding concerning the topic under analysis)

The results of such interviews are shown in figure 6.9.

The results of such an interview with managers can be seen in the following figure:

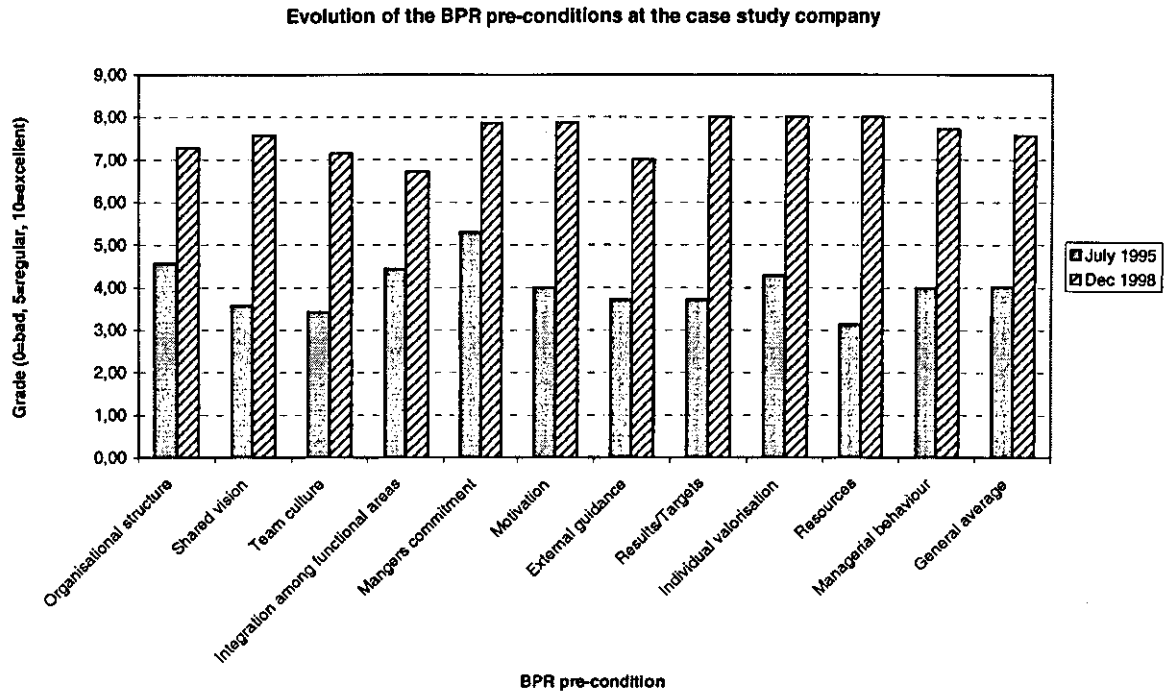


Figure 6.9 – Evolution of the BPR pre-conditions at the case study company

This semi-structured interview was carried out with 7 managers from several different technologies.

In the interviewed managers' perception all BPR pre-conditions evolved considerably, confirming the author's analysis here above described.
The managers also indicated that the business processes evolved, confirming the positive relationship between BPR pre-conditions and processes evolution.
The re-engineering efforts at the case study company started in July 1996, when the BPR pre-conditions were not so good as they were in December 1998. However, in November 1997 a dedicated team of full time people, representing all areas of the company, was assigned to continue the BPR efforts in order to implement ERP software.

Based on the investigations carried out at EMBRAER and the surveys results, the author understands that any company that elaborates a set of actions to contribute to the top ten BPR pre-conditions to succeed, as described above, will experience a significant transformation and will increase its probability of succeeding in a BPR endeavour very much.

6.12.4 Evolution of the Product Development Process

The product development process evolved very much since the company transformation programme started, just after the company privatisation. The following results were achieved:

- The new product development cycle time is predicted to reduced from 54 months to 39 months (reduction of approximately 28%)
- Customers are more involved in the design solutions
- Better cost tracking of the projects (programs)
- Most of the projects (programs) present a better operational margin than the predicted one
- The number of pending "in service problems" was reduced from 150 to 20.
- All projects (programs) are team-oriented inside the matrix organisation ensuring an integrated product development among involved functional areas, which improves product quality and reduces development cycle time.

The evolution of the product development process is very consistent with company transformation and also with a better managerial knowledge of BPR pre-conditions to succeed. All initiatives described in table 7 contributed considerably to achieve those results. Nowadays, people share the same vision, there is a better integration among functional areas, the team culture is spread all over the company, there is a strong commitment from the managerial level with very clearly defined targets, and individual reward helps to motivate the employees towards better results.

The case study company indicates that a well-structured transformation programme may increase very much the managerial knowledge about the BPR pre-conditions to succeed in the re-engineering of a complex product development process. Embraer is being considered as a benchmark company concerning the product development process thanks to the efforts herein described. The company is increasing its market share and also its revenue has increased 4 times from 1995 to 1998. The re-engineering of the product development process has contributed very much to the achievement of such results.

6.13 Research Study Conclusion

The author compared the case study company with what research community says about change management of corporate processes. He found out that the company was very well positioned concerning research community recommendations and observations. Along his work, the author realised that a pattern for change management could be extracted from the case study company history. He elected top ten pre-conditions to succeed in BPR and related them with the actions undertaken by the case study company (as described in table 6.3). A qualitative analysis of such a table indicates that the most important contributions to the improvement of the product development process are related to the leadership behavioural aspects (integration amongst functional areas, shared vision, managers' commitment, change management programme, and team culture).

Therefore, the observations at the case study company indicate that a well-structured programme for cultural transformation of managerial level increases their knowledge about BPR pre-conditions to succeed, and consequently, the probability of success in a re-engineering endeavour. Huczynski (1991) says that learning is the process of acquiring knowledge through experience, which leads to a change in behaviour.

Interviewed managers also indicated the evolution of the new product development process, evidencing the achievement of significant results concerning time, cost and quality.

7. Chapter 7 - Discussions on the Obtained Results and Literature Survey:

The following aim and objectives were stated (see chapter 1):

Aim: to investigate whether management behaviour impairs major changes in corporate processes.

Objectives:

- To test the stated hypothesis "major changes in corporate processes are impaired by management behaviour" in two focused areas:

  - Re-engineering of the New Complex Product Development Process
  - Business Process Re-engineering in Post Privatisation companies

- To relate available literature with actual data coming from surveyed companies, including a case study company in the aeronautical sector.

- To identify a pattern that leads to successful implementation of changes in corporate processes.

- To reveal lessons learned that could be useful for the industrial sector when major processes changes are required.

The following paragraphs discuss whether these objectives have been achieved for this thesis.

7.1 Hypothesis test

Some Research studies were carried out to test the hypothesis, as described below. However, they were concentrated on proving that management behaviour, generally speaking, would impair corporate processes changes rather than concentrated on which management behaviour contribute positively or negatively to corporate process change success. Further work is required to deeply assess how attitudes and behaviour would influence organisational changes results.

- **Research study number 1:**
  Surveys on New Complex Product Development Process
- **Research study number 2:**
  Surveys on Business Process Re-engineering (BPR)
- **Research study number 3:**
  Observation at the case study company

A previous research, carried out by the author, as described by Wright et al. (1995), gave rise to the hypothesis formulation considering that:

- Many companies were unaware of the potential benefits of available design methods to product quality.
- Companies that implement TQM (Total Quality Management), as a management strategy, have an increased perception that a particular method contributes strongly to improving product quality, over companies which do not implement a TQM management strategy.

The researches number 1, 2 and 3 presented a very broad scope and a very small number of sampled companies. Therefore, it allowed a qualitative analysis rather than a quantitative analysis. As a consequence, it is not possible to demonstrate the generalisation of the obtained results. On the other hand, a very specific survey might not allow a broad analysis related to management behaviour. The results obtained in this thesis can be used as a reference to more specific investigations.

The three research studies above described adopted different research methods (mainly semi-structured interview, postal survey and participant observation), which gave the author an opportunity to experience different strategies.

Research number 1 and number 2 are quite independent and focused in different areas (New Complex Product Development Process and BPR in Post Privatisation Companies). Research number 3 connects previous researches through the observations at the case study company.

The obtained results are very compatible with the literature review because they demonstrate that the evolution of such areas is so dynamic and complex that a change in the management knowledge and behaviour is demanded to obtain desired results. An organisational and cultural change is also required.

The research study number 1 revealed that the surveyed companies were experiencing a major change in the product development process with the need of high integration amongst the functional areas. All the surveyed companies had decided to work in a matrix organisation and teamwork was emphasised as a key factor of success. New tools and processes had been introduced. All this together, demands a change in the management behaviour.

The research number 2 revealed that surveyed companies classified the need to change management behaviour and the need to change culture as the main obstacles to carry out Business Process Re-engineering. Furthermore, it seems there is an incompatibility between management expectations and actual results, once the results were considered good, but below the expectations.

The research number 3 revealed that positive results in major changes for corporate process seems to require a systematic set of actions (change management programme) to succeed. The most important contribution to this field of knowledge was the description of such a change management programme. Although it had not been conceived in a broad sense, the author investigations revealed that it existed and it may have caused an improvement in the top ten BPR pre-conditions to succeed in a BPR endeavour. Those ten pre-conditions to succeed in a BPR endeavour were defined by the author, taking into account the literature review. Another important point was the comparison between what the community research says and what the case study has accomplished. It is an interesting approach to check whether7-3a given company is evolving in the management field of knowledge.

The author had not found, in his literature survey, a publication that describes how to create a change management programme to improve managers' behaviour in the re-engineering of the product development process. The studies carried out in the case study company give the basis for such a change management programme.

7.2 Review of research methods

The author used several research methods: postal survey, semi-structured interviews, semi-structured observation and documentary research.

The selection of the research method and also the sampling decision were based in the aim of each research.

The research study number 1, about Integrated Product Development (IPD), used the method of semi-structured interview. The author was not sure whether IPD was being used in the industry. Therefore, a postal survey would not be effective because it was not a matter of evaluating a specific objective. Based in his experience in the case study company, the author suspected that the influence of senior manager in a BPR endeavour would be a critical factor of success. Based on that, an interview would fit the research study aim better than a postal survey. For the same reasons, a structured interview would be very unlikely to get good results because the author did not have enough information about the subject under analysis and he would like to be open to new ideas and suggestions. A non-structured interview would leave the discussion too open, which would demand more time and, consequently, it would not be accepted by the senior managers to be interviewed. Therefore, the semi-structured interview method was chosen. The sampling for that research study was not a probability sampling type because the author tried to select the main aeronautical companies in his perspective. Therefore, it was a purposive sampling (or judgmental sampling). The aim of such sampling was not to generalise all conclusions but understand the trends in the re-engineering of the product development process in surveyed companies that are similar to the case study company.

The research studies number 2, about BPR, used the method of postal survey. Those studies were carried out to identify whether the post privatisation surveyed companies had undertaken a BPR programme and, for those surveyed companies, which were the obstacles and results of such an endeavour. The main reason to use the postal survey was that a large number of companies could be investigated in a short time and with a low level of investment. The second reason was the need to identify the main obstacle when developing a BPR programme without influencing the respondent. In order to get a good response rate the questionnaire had to be short and easily responded. It was a two-page questionnaire with closed and open questions. The return rate was very good (above 35%) which increased the reliability of the studies. As the population of the study was very small, the author decided to send the questionnaire to all involved companies; therefore, it was a purposive sampling.

The research study number 3, about the evolution of the case study company, used the methods of semi-structured observation, questionnaire, semi-structured interview and documentary research. The author was a full participant in the case study company. Therefore, the semi-structured observation allowed him to observe and analyse the behaviour of all involved people, which was very positive to give him confidence in the results achieved in the other research studies.

The case study company was seen as a live "laboratory" for his experiences. The questionnaire was also used to collect information from a large number of employees without influencing them, which gave more reliability to the achieved results. The semi-structured interview was very useful to explain the content of the questions better and to collect the respondent impression as well. Some of the conclusions were subjective and experience based. The sampling design varied to each method. The questionnaire was sent to the entire population, the observation was event based, and the semi-structured interview was carried out with approximately 25% of the involved product development managers.

7.3 Comparison between literature and results

The literature review has covered several topics such as New Product Development, Organisational Culture, Management Behaviour, Integrated Product Development, Business Process Re-engineering, Teamwork, and Privatisation. Those fields of knowledge have presented a very dynamic evolution. Therefore, the literature review provides rather an overview of several topics than a very specific investigation of a given subject. This foundation is compatible with the hypothesis and the focused areas where it has been tested and gave the author a better opportunity to investigate the evolution of the case study company, considering that change in corporate process is a very complex theme.

Literature survey reveals a clear differentiation between culture and behaviour. According to Schein (1985), the term "culture" should be reserved for the deeper level of basic assumptions and beliefs that are shared by members of an organisation that operate unconsciously, and that define in a basic "take-for-granted" fashion an organisation's view of itself and its environment. He also says that culture controls the manager more than the manager controls culture.

Hofstede (1994) use the word "culture" as the shared mental software of the people in an organisation. He categorises culture as follows:

- Process oriented vs. results oriented;
- Employee oriented vs. job oriented;
- Parochial vs. professional;
- Open system vs. closed system;
- Loose control vs. tight control;
- Normative vs. pragmatic

Drucker (1992) says that culture – no matter how defined – is singularly persistent. In fact changing behaviour works only if it is based on the existing "culture". Therefore, it can be noticed that organisational change may not be achieved, in short and medium term, based on cultural change. It shall be pursued through behavioural change.

Sharkey (1999) carried out a survey, which suggests that managers' behaviour and their assumption about leadership changed while the culture did not change. According to him, while one could not document the changes in the organisation's culture one can ascertain significant changes in participant's behaviour.

On the other hand, Kolb et al. (1995) say that most change programmes do not work because they are guided by a theory of change that is fundamentally flawed. The common belief is that the place to begin is with the knowledge and attitudes of individuals. Changes in attitudes, the theory goes, lead to changes in individual behaviour. And changes in individual behaviour, repeated by many people, will result in organisational change. This theory gets the change process exactly backwards. In fact, individual behaviour is powerfully shaped by organisational roles that people play. The most effective way to change behaviour, therefore, is put people in a new organisational context, which imposes new roles, responsibilities, and relationship on them.

Worrall and Cooper (1998) revealed from a research with over 1,000 managers that around 60% of managers had experienced some form of reorganisation in the last year. The majority of managers in private and public sector organisations in UK have experienced massive change in the nature of work over the last five years.

Above described assumptions influenced very much the author when defining the hypothesis statement: **"Major changes in corporate processes are impaired by management behaviour".**

The author understands that cultural aspects, described by Schein(1985), Hofstede (1994), Drucker (1992) and Sharkey (1999), as well as organisational drivers, described by Kolb et al. (1995) are key root causes for managers attitude and behaviour.

Figures 5.3 and 5.7 (see chapter 5) indicate that organisational changes are frequent after a company privatisation (privatisation might be considered a major disruption in corporate processes) and the top chosen problems to implement business process re-engineering are related to managers' behaviour and cultural aspects.

The author supposed, before running the surveys herein described, that the impact of managers' behaviour on major changes in corporate processes would be more evident than cultural aspects. Figure 5.7 indicates that both (managers' behaviour and cultural aspects) are equally realised as the7-7major source of resistance to business process re-engineering.

Therefore, a change management programme should consider that cultural aspects and organisational changes drive employees behaviour. Table 6.1 (see chapter 6) indicates that the change management programme carried out in the case study company (Embraer) encompassed actions related to cultural and behavioural aspects, as well as the implementation of organisational changes.

The author focused his analysis in two areas:

- Re-engineering of the New Complex Product Development Process;
- Business Process Re-engineering in Post Privatisation companies

The literature survey brought out several aspects of focused areas, which indicate a profound change in corporate culture and organisation, driven by market needs.

The product development process has evolved significantly in the last decade. It changed from a fragmented activity carried out by functional areas for an integrated process carried out by multi-disciplinary teams. The concept of concurrent engineering, superseded by the concept of Integrated Product Development, emphasised the benefits of running concurrently activities, which are under the responsibility of several functional areas. The Integrated Product Development philosophy expanded the product development to a corporate matter, which involves cultural and behavioural changes. This is particularly true when talking about teamwork environment.

The literature survey about business process re-engineering (see paragraph 2.4) revealed that the most common failures to re-engineer a process were related to managers' attitudes and behaviours.

The author classifies the change in product development philosophy as a major change in corporate processes. Therefore a deep assessment on this change would bring subsides to test the stated hypothesis. The mentioned assessment was carried out by the author based on the literature survey, benchmark activities and specific surveys, which led him to propose top ten BPR pre-conditions to succeed in a major corporate process re-engineering.

The case study company was analysed by the author against the described top ten pre-conditions to succeed. It can be noticed, by reading the summary of each major action undertaken by the case study company (see paragraph 6.12.1), a high content of actions towards behavioural changes. Therefore, it might be argued that the top ten pre-conditions to succeed would not evolve as required if management behaviour does not support them.

The remaining paragraphs of literature survey session (2.5 to 2.8) revealed that management behaviour is a key point to understand the current management trends. Therefore, the entire literature survey contributed very much to build author's opinion about the importance of management behaviour to the success of a given change in corporate processes.

7.4 Generalisation of the results

The hypothesis states **"Major changes in corporate processes are impaired by management behaviour "**.

The encountered results should not be generalised because the samples are very small (less than 50 respondents). Additionally, the investigation was limited to re-engineering of new complex product development process and BPR in post privatisation companies, which do not allow a generalisation of the hypothesis to all industry and services segments.

Research studies number 2, about BPR in post privatised companies, revealed similar obstacles for the industry in the UK and in Brazil. Considering that most of the UK surveyed companies were privatised in the 1980's while most of the Brazilian surveyed companies were privatised in the 1990's, the effect of privatisation process was not strong in the UK surveyed companies when the research studies were carried out. This is an indication that the encountered obstacles to BPR implementation (the need to change management behaviour and the need to change culture) might be applicable to any company, no matter if it is privatised[7-9] or not. The same applies to the excessive

expectation about the results of a BPR endeavour. Considering that the surveyed companies did not necessarily develop complex products, it might be concluded that the encountered obstacle may apply to any type of company. However the small number of sampled companies does not allow much confidence on such extrapolation.

Research study number 1 (about Integrated Product Development (IPD) process) also revealed the need of a cultural change in the perspective of senior managers. Once IPD represents the effort to re-engineer a given process, the same conclusions might be achieved for the remaining enterprise processes. However, there is not enough information to rely on this conclusion

7.5 Recommendation for the industry

The research studies, which support the hypothesis, were conducted in a very broad manner. The surveyed companies were from the UK, Brazil and North America. Based on the literature survey and his practical experience, the author elected the top ten factors, which would contribute the most to the success of a BPR endeavour in the case study company. Then, the author observed the case study company evolution against the elected top ten pre-conditions. All of them require a management behavioural change to succeed in the author's point of view, as described in chapter 6.

The investigations at the case study company revealed that if the top ten BPR pre-conditions evolve, it is likely to have success in the BPR activities. Therefore, if a company establishes a set of actions (change management programme) in order to improve the top ten BPR pre-conditions, it will probably have a good result in the BPR activities. This pattern was revealed during thesis development and the author considers it as the most valuable contribution to the knowledge coming from this thesis

Taking into account the research studies, and the lessons learned, the author achieved the following conclusions, which may be useful to the industry sector:

- To maximise the results of a Business Process Re-engineering (BPR) endeavour, a company should establish a set of actions (such as organisational structure change, change management initiatives, team culture) that must be used as the basis for an intensive change management programme.

- The change in the management behaviour and culture is a basic requirement for increasing the probability of success in a BPR programme.

- The more complex the product, the more attention should be given to the cultural change and the integration amongst functional areas.

- It has been indicated that changes such as privatisation and BPR require a considerable amount of time to deal with cultural adaptations. Therefore they should be implemented in a gradual manner to produce the expected results.

- The Integrated product Development (IPD) philosophy is an excellent basis for the re-engineering of the product development process.

7.6 Further *Work*

The author understands that two major paths could be worked on from this thesis. The first one would be related to an expansion of the work already done while the second one would be related to complementary ideas derived from the work already done. Both paths are discussed below:

- **Expansion of the work already done:**

This thesis concentrates very much on companies that develop complex products and/or post privatisation companies. The main countries surveyed were the UK, the USA, and Brazil. The research could be extended to other European, South America and Asian countries. At the end of the day, a comparison between developed countries and developing countries could be done. This would bring very important data to suggest how the latter could speed up their progress on BPR by acting on the main obstacles already known by developed countries.

The BPR research could also be done in private companies that have not experienced a privatisation process. With a larger number of sampled companies, quantitative analysis would be more reliable and could allow a generalisation of the findings.

- **Complementary work:**

Other market segments could also be explored, such as services, commerce and medical segments. This approach would allow us to reach a conclusion about the actual use of BPR on those segments.

As the main problems faced during BPR implementation are associated with human behaviour aspects, it would be worthwhile if one could investigate some techniques that would cause a change in the mental approach.

In the author's point of view, the most suitable technique for this purpose is the Neuro Linguistic Programming (NLP).

The NLP is based on the identification of basic models that can be learned by acting on some brain controls through our sensitive organs (eyes, mouth, ears, nose, and skin).

NLP can change our internal paradigms with simple exercises that can reprogram our brain. Our beliefs, mood, objectives and goals can be easily reviewed.
Bearing in mind that new working philosophies demand a change of employees' paradigms we can foresee the impacts of this science on the organisational behaviour. Companies could get a high level of commitment from their employees by training them to have common beliefs, good mood, clear objectives and goals.

Mintzberg (1994) states that after breaking the jobs into pieces for many years, it is time to consider the "integrated job of managing". He understands managers create "mental models". According to him, the managers' purpose, perspective, and positions give rise to a mental model or frame called "conceiving" which will determine their style.
Bandler (1985) states that NLP is an educational process rather than a therapy. "We are, essentially, developing ways of teaching people to use their brain". He wants people to learn how to change and how to control their mind programming.

The author understands that a "blending" between NLP and Learning Organisation philosophy should be analysed to evaluate whether they could be used, simultaneously, to guarantee a real company and people evolution.
Based on the achieved results of this thesis, the author advocates that a Mind Process Re-engineering (MPR) should be included, at least for the management level, as one BPR pre-condition to succeed. Furthermore, the author understands that the BPR cycle time would be considerably reduced by proper use of MPR based on the NLP.

A variant of the main hypothesis could be stated as follows: "A Mind Process Re-engineering (MPR), based on Neuro Linguistic Programming (NLP), is a significant factor to succeed and speed up a Business Process Re-engineering (BPR) Programme".

8. Conclusions

The author understands that the stated aim and objectives for this thesis were met (see discussions in chapter 7). Therefore, final analysis is concentrated on hypothesis veracity as well as on success and limitations of the work.

8.1 Hypothesis veracity

The following hypothesis was proposed:

Major changes in corporate processes are impaired by management behaviour

That hypothesis was tested based on research studies carried out in two focused areas, as follows:

- Re-engineering of the New Complex Product Development Process
- Business Process Re-engineering in Post Privatisation companies

Those areas were chosen because they represent major changes in corporate process and the author could develop a comparative observation between the company he works for, a Brazilian aircraft manufacturer (Embraer), and other surveyed companies.

The hypothesis above described was tested by the research studies described below:

- **Research study number 1:**
  Surveys on New Complex Product Development Process
- **Research study number 2:**
  Surveys on Business Process Re-engineering (BPR)
- **Research study number 3:**
  Observation at the case study company

The literature survey revealed the main organisational trends in modern organisations, evidencing the need of managerial knowledge updating to cope with the required behavioural and cultural transformation. In addition, the privatisation process demands a change in the managers' role, requiring more accountability for company results. The business process re-engineering is seen as a set of actions required to improve the value of the company to its stakeholders. The right preparation to enter into a re-engineering endeavour is recognised by several authors as a key factor to succeed. It was also revealed that the product development process has been evolving considerably in the last decade.

The research study number 1, about integrated product development (IPD), identified a strong evolution of IPD in the main North American aeronautical companies that deal with very complex products. It also indicated some changes in the role of managers, team building approach and cultural adaptation of enterprise to a more organised structure to develop complex products.

The research study number 2, about BPR in post privatisation companies, indicated that leaders may have expected more benefits than they really got, which may be an indication that they were not aware of all BPR characteristics and consequences. It was also evidenced that the main obstacles to be faced during BPR were related to the need to change management behaviour and the need to change culture, which suggested the need of having a cultural transformation programme to address the main BPR pre-conditions to succeed.

All the above results were compared with the case study company, which is a well representative "laboratory" for the hypothesis once it was privatised in December 1994, it develops very complex products (aeroplanes) and it has implemented BPR for the product development process, supported by a strong set of actions to transform the management culture within the company. The results obtained by the case study company are very positive and they may be related to the evolution of the company concerning the product development process. All BPR pitfalls, as well as behavioural and cultural aspects mentioned in the literature survey were analysed in the case study company and the surveyed managers recognised a strong evolution in all topics considered as BPR pre-conditions to succeed.

The author analysed the evolution of the case study company concerning the top BPR pre-conditions to succeed and identified a pattern to explain the positive results achieved by the company. This relates to a systematic change management programme, which may be taken as an upfront strategy to succeed when major changes in corporate processes are required.

Therefore, based on the above analysis, the author concludes that the hypothesis was proved for the focused areas (re-engineering of the new complex product development process and BPR in post privatisation companies), once there are clear and significant evidences about the need to adapt managerial behaviour when major process changes occur, based on pre-conditions to succeed in a re-engineering endeavour.

8.2 Success and limitations of the work

The most important contribution of this thesis is related to the identification of a pattern in the case study company to deal with major changes in corporate process. Such a pattern may be extended to other companies. The investigations at the case study company indicated that if the top ten BPR pre-conditions to succeed evolve, it is likely to have success in the BPR activities. Therefore, if a company establishes a set of actions (change management programme) in order to improve the top ten BPR pre-conditions, it will probably have a good result in the BPR activities.

The case study company was an excellent laboratory to test the hypothesis in the day-to-day activities. The comparison of research studies results with the case study activities was very fruitful because it was a way to gain confidence in the achieved results.

All surveys presented a very good response rate (above 35%), considering the profile of the respondents (senior managers). This reveals an adequate research approach, which can be extended to further work in this area.

This thesis has assessed a segment (post privatisation industry) that apparently has not been very well explored in terms of academic research. However, it offers an excellent opportunity to analyse the behaviour of a Business Unit that has experienced a major discontinuity in its administrative life. That kind of abrupt change usually requires a very fast recovery due to the shareholders expectations. Therefore, the post privatisation industries are a natural laboratory of business transformation, which could be used as a reference for any other industry segment .

The work presented some limitations, as follows:

The performed surveys assessed a limited number of companies due to the adopted restrictions for analysing the complex product development process and privatised companies. An extension of those surveys to other industry and services segments could confirm the generalisation of the results. The samples were very small, impeding reliable quantitative analysis. Therefore, most of the findings were based in qualitative and non-probability analysis.

The questionnaires of postal surveys had to be short to achieve a good response rate, due to the characteristics of the respondents (senior managers), who usually may not expend much time with this kind of activity. As a consequence, some terms of the questions were not described in detail, which may have given rise to different interpretations by the respondent.

A single case study company was chosen in order to make a deep assessment of product development process evolution, focusing on day-to-day observations and surveys. The same approach could have been carried out in other companies to confirm the achieved results.

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10.Appendix I

"Questionnaire about Business Process Re-engineering"

Research studies number 2 (Survey on Business Process Re-engineering)

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Business Process Re-engineering (BPR) - Questionnaire

We undertake not to publish the information provided in this questionnaire in a way that will enable others to identify the name of the person or company providing it.

1. Details of the individual completing this questionnaire (optional).

Name: .....

Job title: .....

Would you give us permission to contact you for further details? Yes ☐ No ☐

If "Yes", how may we contact you?

Telephone number: .....

Fax number: .....

2. In which year did your organisation start to trade as a privatised company?

19 .....

3. Did your company make any organisational changes in the first year following privatisation?

Yes ☐ (if "yes" go to question 4) No ☐ (if "no" go to question 5)

4. Which of the following best describes the scale of these changes to the company's organisation ?

Minor ☐ Moderate ☐ Major ☐

5. Has your company used the principals of Business Process Re-engineering (BPR) at any time since privatisation?

Yes ☐ (if "yes" go to question 6) No ☐ (if "no" go to 15)

6. When did you start using BPR principals?

19 .....

7. How long has the BPR process taken?

We completed the BPR process in the year 19 .....

We are still actively applying BPR principals ☐

Although we are not currently using BPR, we will need to use it again in the future ☐

8. Which major processes in your company have been modified by BPR ? (Please list)

....

....

....

....

9. How do you rate the benefits to your company that BPR has brought about so far?

Minor ☐ Moderate ☐ Major ☐

10. If your company hired consultants to assist with the application of BPR, with which aspects of the process were they involved?

Diagnosis ☐ Planning ☐

New process specification ☐ New process implementation ☐

11. What were the biggest problems that your company faced during BPR? (Tick up to 3)

Lack of internal knowledge	☐	Expertise of staff	☐
Lack of external guidance	☐	Lack of consensus	☐
Insufficient resources	☐	Lack of commitment	☐
The difficulty of forecasting benefits	☐	The need to change culture	☐
The need to change management behaviour	☐	Information technology	☐

Others ☐ (please specify)

.....

.....

12. In comparison to your original hopes and expectations, did BPR:

Take less time than you expected? ☐

Take as long as you expected? ☐

Take longer than you expected? ☐

13. In comparison to your original hopes and expectations, did BPR:

Bring less benefits than you expected? ☐

Bring the benefits that you expected? ☐

Bring benefits in excess of what you expected? ☐

14. In comparison to your original hopes and expectations, did BPR:

Cost less than you expected? ☐

Cost the same as you expected? ☐

Cost more than you expected? ☐

15. Thank you for completing this questionnaire. We would be grateful if you would return it to us in the enclosed stamped addressed envelope.

The information collected from these questionnaires may be published in the form of a report, but the names of contributing companies will not be identified either explicitly or implicitly.

If you would like to receive a copy of the report please tick this box ☐

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