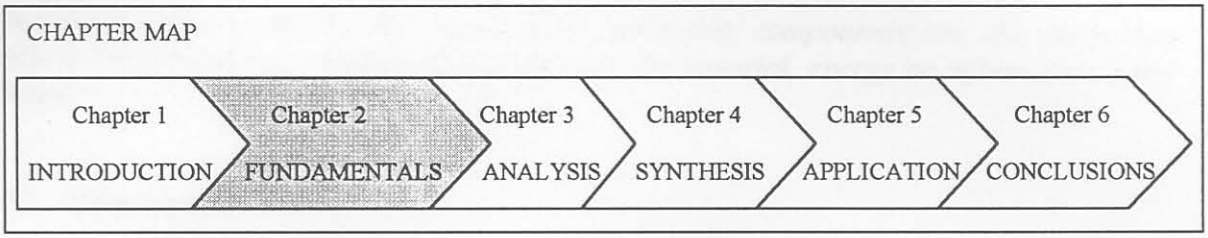
2. Fundamentals

2.1 Chapter context

The purpose of this chapter is to define the baseline from which analysis will progress towards the final conclusion.



This section describes concepts that are important to a holistic understanding of this study. Their purpose is two-fold, namely (1) to provide transparency for concepts alluded to later and (2) to establish building blocks for the construction of the theory purported herein.

2.2 Systems approach

During recent years, the employment of the concept of general systems theory has provided the means for reaping increasingly higher levels of synergy via the multi-disciplinary nature of the concept. This is done via the concerted integration of scientific knowledge and acumen across the various functional boundaries. von Bertalanffy, a pioneer of this concept put forth the following view [19, p176]:

"If we survey the various fields of modern science, we notice a dramatic and amazing evolution. Similar conceptions and principles have risen in quite different realms, although this parallelism of ideas is the result of independent developments, and the workers in the individual fields are hardly aware of the common trend. Thus, the principles of wholeness of organisation, and of the dynamic conception of reality become apparent in all fields of science."

The validity of the view is evident in the quotation taken from a person (von Bertalanffy) with an academic background in the biological sciences [20]and applied to the business environment. This case has been illustrated by various authors [21,22]. It is now appropriate to define a few key factors which are pertinent to the description of the systems approach.

2.2.1 System

A system is a meaningful combination of two or more components or subsystems, identifiable by their particular attributes, functioning in a manner conducive to the fruition of their common objective. The composition of a system is based on the meaningful organisation of the components, in such a way, that discernible boundaries can be identified from its supra-system. This means of classification is done by the analyst in order to understand the functioning of the system and components (if so required), thereby improving the overall

objectives of the system under consideration. The elements constituting a system, in simplistic terms are shown in Figure 3.

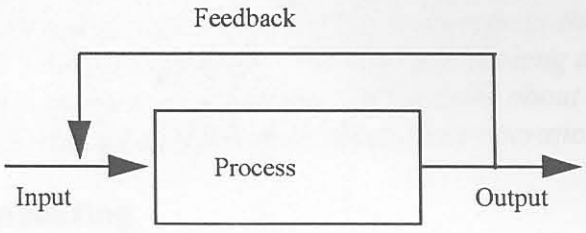


Figure 3 - Elements of a System

A system's components will perform a means of processing in order for all to attain a common goal. Figure 3 represents an open system where interaction in the form of material, energy or information across the system boundary takes place. In contrast, a closed system does not have input or output characteristics, and is subject to the forces of entropy. The implication is that a business entity, being considered in system terms needs appropriate interaction with the supra-system or external environment in order that the market forces have a favourable impact on the system. An organisation will have attributes unique to the particular organisation, hence the degree of "openness" or "closedness" is a relative measure.

Blanchard and Fabrycky [23, pp. 4-5] have defined three categories of components within the system, namely structural, operating and flow. Their functions are described as follows:

"Structural components are the static parts, operating components are the parts that perform the processing, and flow components are the material, energy or information being altered."

2.2.2 Cybernetics

The concept of cybernetics [24] pertains to the self-regulatory nature or self-governance of the system. Core to this, is the concept of feedback as illustrated in Figure 3. Kast and Rosenzweig [21, p. 107] describe feedback as follows:

"The concept of feedback is important in understanding how a system maintains a steady state. Information concerning the outputs or the process of the system is fed back as an input into the system, perhaps leading to changes in the transformation process and/or future outputs. Feedback can be both positive and negative, although the field of cybernetics is based on negative feedback. Negative feedback is informational input which indicates that the system is deviating from a prescribed course and should readjust to a new steady state."

In terms of the business entity, feedback would mean the need for transformation based on the output of the organisation, or the results thereof. Losses could indicate the need for relocation, cost-cutting, restructuring, new products etc. One of the best forms of feedback that a business entity can receive is from the market it supplies. This is open systems orientated and outward focused. In implementing a new "solution", the same process is used to manage the change process to ensure the attainment of the initial objectives.

2.2.3 Equifinality

Equifinality describes the characteristics of an open system where the output is related in some manner to the nature of the input. This concept describes a cause-effect relationship between the input conditions and the resulting state of the system under consideration. While this is true for mechanical orientated systems, this is not always the case for social systems. In business systems, this relationship may be analysed by the Ishikawa or "fish-bone" technique [29], as a means of deriving the core input signal, or core problem. Viewing this process in reverse, it becomes possible to achieve certain desired results via the implementation of varying, but predetermined inputs or stimuli.

2.2.4 Steady state

Steady state within a closed system is achieved via the final result of maximum entropy, i.e. chaos. Steady state within an open system on the other hand can be achieved via dynamic equilibrium resulting from the continual inputs of production factors in the case of a business entity. Raven [25, p.105] describes steady state operation as follows:

"By steady state operation is meant the equilibrium state attained such that there is no change with respect to time of any of the system variables. The system remains at this equilibrium state of operation until it is excited by a change in the desired input or in the external disturbance. A transient condition is said to exist as long as any of the variables of the system is changing with time. Considerable information about the basic character of a system may be obtained from an analysis of its steady state operation."

2.3 Industrial engineering

Industrial engineering is defined as follows by the Institute of Industrial Engineers (IIE) [26, P1.1.1]:

"concerned with the design, improvement and installation of integrated systems of people, materials, equipment, and energy. It draws upon specialised knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design to specify, predict, evaluate the results obtained from such systems."

Bosman and Moll expanded the definition as follows [27]:

"concerned with the design, improvement and installation of integrated systems of human resources, materials, equipment, energy and information. It draws upon specialised knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design to specify, predict, evaluate and optimise the results obtained from such systems. The discipline focuses on the perpetual improvement of these systems and their interaction amongst one another and the production factors to ultimately improve performance."

Analysis of the aforementioned definitions, implicates the industrial engineering discipline as follows:

- The industrial engineer is well equipped to analyse and design the means for improving business systems.
- The task of specifying, predicting and evaluating results related to the system are undertaken by the industrial engineer.
- As per previous conceptual definition of the task of business management [4], the management of a business and the skills of the industrial engineer are closely related, although the industrial engineer has a sound scientific viewpoint. The task of the industrial engineer can therefore be either participative or committed in the facilitation of managing the tasks associated with the business change.

2.4 Operations research

This section is based on Winston [28].

During the Second World War, scientists and engineers were tasked by the British military to analyse a host of problems. These problems included convoy management, bombing operations, radar deployment, etc. The use of mathematics and the engineering method in solving these problems was called operations research. Today, operations research, or management science, implies a scientific approach to solving problems involving scarce or costly production factors, using predominantly mathematical means. Operations research is, however, moving to non-mathematical means as well.

Winston [28, p 2] illustrates the operations research methodology in Figure 4.

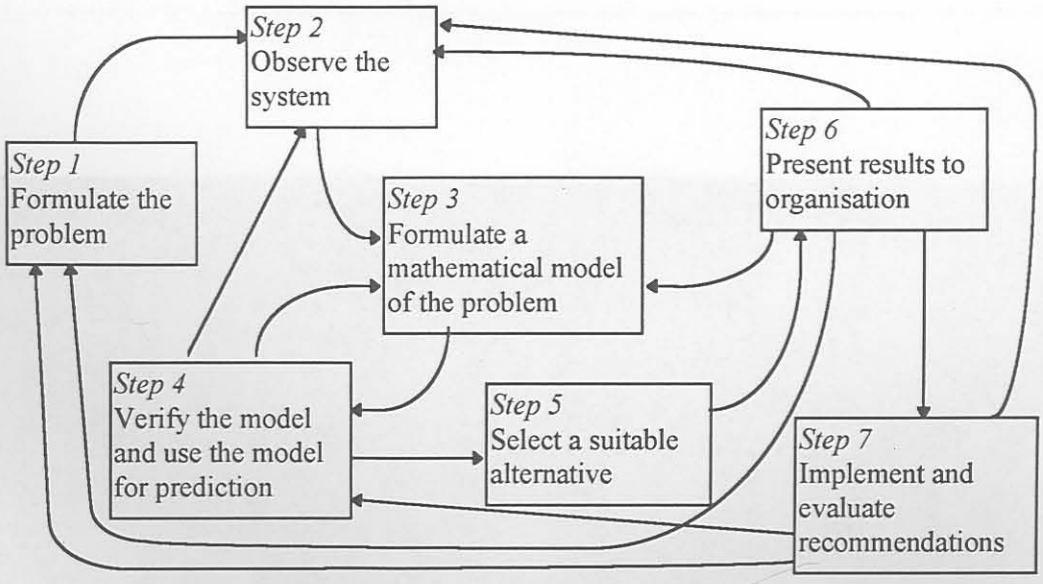


Figure 4 - Winston's Operations Research Methodology

As indicated in Figure 4, the elements of the methodology are forwards as well as backwards interactive. It is this iterative process that provides the means for a set of solutions that are appropriate for the problem under consideration.

The researcher describes a modified form of Winston's operations research or management science approach to problem solving as follows[1]:

- **Monitor the performance of the business entity against its predefined strategy**. In most cases a form of strategy will exist for the business entity where the desired direction of the business should be taken. If, on measuring the current status of the entity, the performance is found wanting, recourse is taken. Based on this model, it is now apparent that a problem does indeed exist.
- **Describe the problem**. The problem may not always be clear-cut, and some work may be required to provide a clear understanding thereof. The problem may be manifesting itself in various forms of symptoms, and more advanced technique may be required to isolate and adequately describe the core problem. The Ishikawa diagram [29] is one of several techniques available to undertake this form of analysis.
- **Define a model that simulates the problem**. The appropriate technique must either be selected or developed which adequately describes the "real world" representation of the problem under consideration. Part of this activity involves the collection and collation of data relevant to the subject field. The purpose of the data is to, firstly, devise a technique, secondly, build the model, and thirdly, test the model.
- **Generate feasible solutions**. Once the model, or models have been established, the various feasible solutions need to be generated.
- **Test the model(s) and its/their solution(s)**. The credibility of the models and solutions need to be confirmed. This is done via tests based on the original data and or confirmation with other knowledgeables via the Delphi technique as an example.
- **Select a single or appropriate portfolio of solutions**. The decision maker(s) must select a solution compatible to the objective evaluation based on the criteria relevant to the success of the business entity. Depending on the entity's means, a portfolio of solutions may be selected.
- **Implement the solution**. The next step is to implement the solution as determined by the relevant decision maker(s). This is often where the task is left to defend for itself. In reality the task of institution of change and the ensuing management thereof, takes as much if not more work. At this point the management changes from the hard issues (numbers) to soft issues (people).
- **Iterate**. As described earlier, business improvement is a continuous process.

Operations research encompasses various categories of techniques which are discussed later in the text.

[1] Conceptually, this approach is generic enough to be able to also tackle problem solving not directly related to operations research.

2.5 Business

In order to understand the nature of the system under consideration, so as to make recommendations regarding its improvement, it is essential to comprehend the fundamental nature of that system.

Business can be described as all concerted activity aimed at the sustained creation of wealth for its stakeholders, by the exploitation of its production factors. This activity is based on the commercial principle, where goods and or services are traded in exchange for an equitable form of remuneration, for the perceived value added, such as money.

The objective of a business as described in the context of this study is to create wealth on a sustainable basis. While this infers directly to monetary terms (making money now and in the future [30]), the other characteristics of wealth are also assumed.

The business, viewed as a system is part of the supra-system, namely its external environment. This is shown in Figure 5 where the business entity and environment are illustrated in terms of the systems approach.

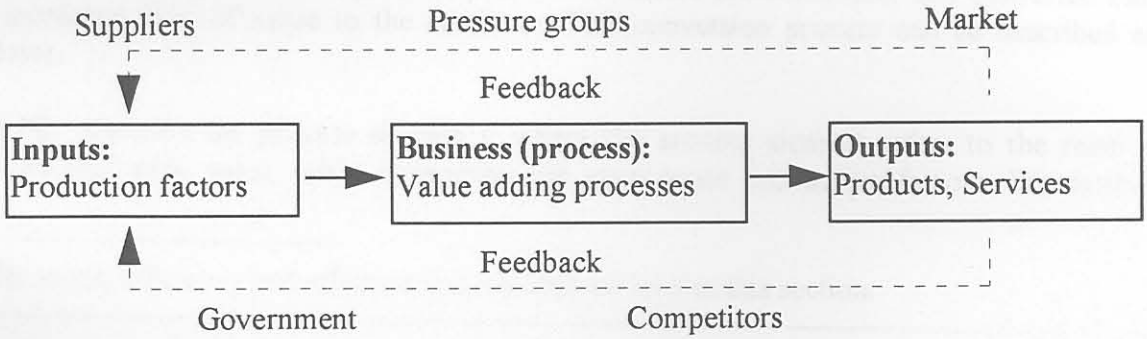


Figure 5 - Business Environment

A business must be based on the open systems approach. If this is not the case than it will descend into a state of atrophy according to the entropic principle. A business entity being an open system, is subject to much influence from the external environment. This influence is exercised by legal precepts, consumer requirements, pressure groups, competitors, technology advancement, etc. The external environment examines the outputs of the system and asserts critique regarding the nature of the outputs. This feedback may be examined and used for improvement or regulatory purposes by the management of this business entity. It is the systems choice to accept or reject this feedback. If this is rejected, the entity will experience a move towards a closed system perspective. If this feedback is used as a catalyst to change, the entity must devise a means of changing the processing characteristics accordingly. The relevant parameters will be adjusted, based on perceived value and juxtaposed risk, and managed appropriately.

From Figure 5, the business entity takes input (production factors) and adds market perceived value to this and then delivers this output (goods or services) to the targeted market. The value that is added is done via a predefined mechanism or process. The efficiency and

effectiveness[1] of the activities comprising the process, determine the nature of the value that is passed on to the output. Consider a business entity that grows and processes chickens for the market. The inputs, processes and outputs are described in simplified terms, as follows:

Good chicken stock is either purchased or bred. The chicks are given water, feed constituent of maize and various other nutrients, and medication. During the growth of the chicks, electricity, other utilities and varying skills regarding manpower are consumed. When these chickens are ready for slaughter, they are transported en masse, per house, to the designated processing plants. At the plant, the chickens are hung on shackles, weighed and then have their throats slit (for the benefit of the various religious consumers). The carcasses are then heated to the relevant customers' specifications and defeathered. The next step involves the evisceration of the birds where all the innards are collected for differing purposes. Some birds are frozen, while the others are processed further in various product forms, such as thighs, mixed portions, whole chickens, livers, heads, etc. These products are all packaged for the customer and then distributed countrywide to the relevant customers' required sites. This process is illustrated in Figure 6.

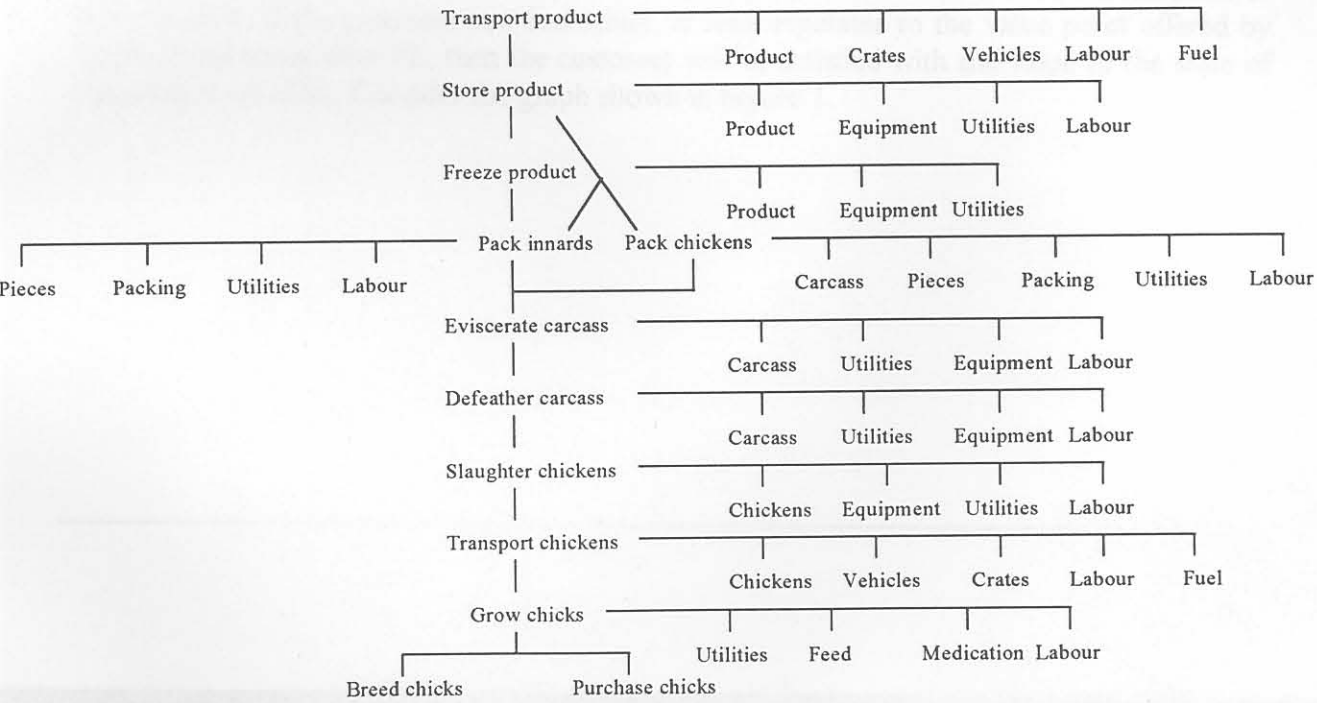


Figure 6 - Process of Producing Chicken Product

From this example, it is evident that many activities, make up the complete process that deliver the chicks in some form and then deliver the desired processed form to the end customers. During the whole process, production factors are consumed, and converted into an increased form of value to the customer. This conversion process can be described as follows:

Let PE_i describe the process element i, where the process element refers to the relative activity that adds value, while consuming the appropriate production factors. We further

[1] The terms, efficiency and effectiveness, are defined later in this section.

define NV[PE_i] as the net value added to the process element PE_i, were net value is equal to the difference between the cumulative net value for PE_{i-1} and PE_i . The cumulative net value for a product (CNV), relevant to the degree of processing, i.e. the last process element that has been successfully undertaken, is given by:

Equation 1

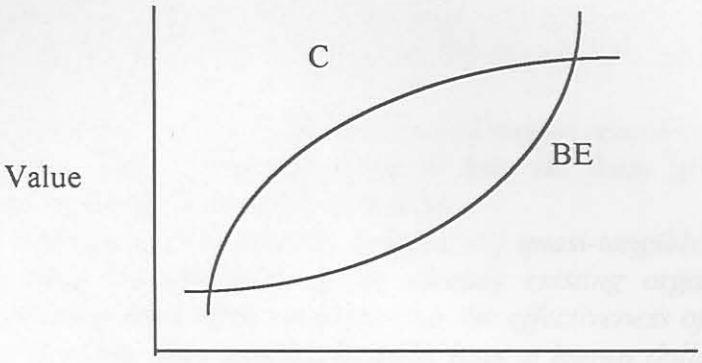
$$CNV[PE_i] = \sum_{j=1}^{i} NV[PE_j]$$

This current value of the product is relevant to the viewpoint of the system under consideration. To the business entity (processing the chicken), the value of the chicken item, after being processed by PE_i is seen as the proportioned consumed production factors, attributable to the item at that point. If the business system and its supra-system remains at status quo, i.e. no growth is required, then a commercial relationship could be established with a customer, where the customer could exchange the item for money, as example, at this break-even point of value.

In real terms however, influencing forces like inflation and social growth needs, require that the business entity exchange the item at a relative price, higher than the break-even point of value. The test of value is then whether the market forces of supply and demand are in equilibrium at this point. If the marginal rate passed through to the customer is unacceptable, then the business is at risk, as this item will not be absorbed into the market. Contingencies for primarily, survival, and secondarily, prosperity needs, must be put into place. When equilibrium regarding CNV[PE_i] is not achieved in exchanging the product for "money", the business entity is exposed to risks. These include:

- The organisation of the processes leading up to PE_i is too costly.
- The productivity in downstream process elements may be such that the difference between customer perceived value and "real" process generated value is too great, i.e. PE_i may be too soon for the business entity to seek an exchange.
- The customer does not have the means for utilising the product in its form after PE_i.
- The technology is such that the customer does not perceive equitable value for the cost that the customer must bear in exchange.

From the customer's perspective, value is seen differently. It is viewed entirely from a point of view of need. If the customer can find utility, at least equitable to the value point offered by the business entity after PE_i then the customer will be satisfied with the value of the state of the product on offer. Consider the graph shown in Figure 7.



BE: Business entity - real value
C: Customer - perceived value

Figure 7 - Value Curves

There are two points where the business entity's curve of real value and the customers curve of perceived value intersect. This indicates a feasible region, between these two points, in which exchange between the business entity and the customer can take place. Note that the real value curve includes proportionate production factor consumption as well as margin due to the real market forces. The feasible region can be described as the market value range for the item. This is the value that the market in general would be willing to exchange for, based on the relative process element, i.e. this is the area where the concept of value is common between the two perspectives. In this region the commercial relationship regarding the item is in equilibrium.

Taking normal market forces into account, the business entity would run a risk of not receiving fair trade for the item if tendered outside the feasible region. Beyond the upper intersection point, as an example, the risk is great that the item will not be purchased or traded by the customer, although the potential returns are equally great. This analysis does not imply that there are no risks within the feasible region. This analysis pertains merely to the market forces of supply and demand, and does not take other operational factors into account. These must therefore be considered in conjunction with strategies regarding the feasible region.

An overview regarding business has been given. Following this, a few key concepts are discussed, which, depending on their impact, colour the nature of the business entity.

2.5.1 Value, utility and benefit

The term value and utility has been used to considerable extent thus far. It is however important to understand what is meant by value. The Oxford Dictionary [74] defines value as:

"1. Worth, desirability, utility, qualities on which these depend. 2. Purchasing power, power of a commodity to purchase others, amount of money or (Econ.) other commodities for which the thing can be exchanged in open market."

Thuesen and Fabrycky [31, pp 17-18] define and draw a distinction between value and utility from the perspective of the customer as discussed earlier in the text:

*"The term **value** has a variety of meanings. In economics, value designates the worth that a person attaches to an object or a service. Thus the value of an object is inherent not in the object but in the regard that a person has for it. Value should not be confused with the cost or the price of an object in engineering economy studies. There may be little or no relation between the value a person ascribes to an article and the cost of providing it, or the price that is asked for it.*
*The general economic meaning of the term **utility** is the power to satisfy human wants. The utility that an object has for an individual is determined by him or her. Thus, the utility of an object, like its value, inheres not to the object itself but in the regard that a person has for it. Utility and value in the sense used here are closely related. The utility that an object has for a person is the satisfaction he or she derives from it. Value is an appraisal of utility in terms of the medium of exchange."*

The term benefit is frequently employed to describe the beneficial returns that may be encountered if an investment in kind is ventured. This can be undertaken via means of a cost benefit analysis (CBA) where the costs of investment are evaluated against the benefits returned to the investors. Parker and Benson [32, p90,92] describe the relationship as follows:

*"A **cost** is a measurement of the amount of resources required to obtain a product. Costs are expressed in quantitative dollars required. **Benefits** take the form of cost saving, cost avoidance, generation of new revenues and intangibles.*
There are three types of benefits: (1) tangible benefits; (2) quasi-tangible benefits, focusing most often on improving the efficiency of the already existing organisation; and (3) intangible benefits, focusing most often on improving the effectiveness of the organisation. Of the three types of benefits, only tangible benefits have a known dollar impact on cash flow."

Traditionally, benefits in the cost benefits analysis perspective have been associated with cost reduction [32, p12]. The benefits have been largely tangible in nature and can be related into financial terms for purposes of equivalence. Thuesen and Fabrycky [31, p 334] further define that the net benefit is equal to the advantages of the investment, less the disadvantages thereof. Parker and Benson [32, p12] integrate the concepts and value and benefit as follows. They extend the cost reduction perspective of traditional benefit to further take into account, the other inherent values therein. In other words, the intangible positive aspects related to the investment are taken into account and are quantifiable via appropriate means in order that equivalence regarding criteria are established. The purpose of this is to be able to establish the real worth of the investment.

2.5.2 Value Chain concepts

An extension of the concept of accumulating value is the value chain approach of Porter [33]. This is illustrated by Figure 8.

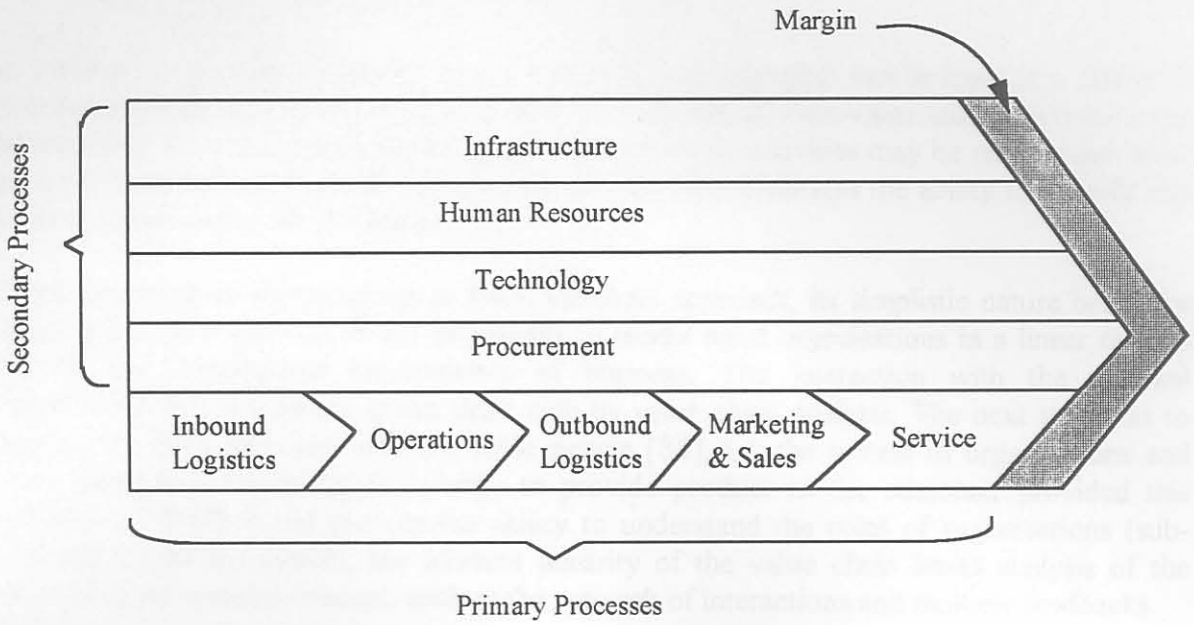


Figure 8 - Porter's Value Chain Structure

The distinction is made between primary processes and secondary processes. Primary processes are those sequential set of serial or parallel activities, aimed at providing the product or service of the organisation, for which that organisation is distinguished. This approach allows for focusing on the business entity's core competencies. Secondary processes are likewise a set of activities, but are however aimed at maintaining the successful continuance of an activity, or set of activities in the primary process.

Porter identifies the following five generic activities that are conducted in the main line of business (LOB) of an organisation. Inbound logistics describes the activities related to the receiving and handling of the business entity (system) inputs. Operations describes the processing that takes place within the entity, where the inputs are converted into the outputs, i.e. products or services. Outbound logistics refers to the activities that accumulate, store and distribute the outputs to the customers. Sales and marketing provide the allure and means for the customer to take ownership of the product. Service pertains to the process activities that either enhance or maintain the level of value of the product.

The generic secondary activities of Porter which ensure the success of the primary, are infrastructure, human resources management, technology development, and procurement. Consider the example of the chicken producer (described earlier), various supporting processes need to be put into place to ensure chickens are provided to the market at market value. There are two examples of secondary processes which must be effectively managed. In the first example, the business entity needs to have "good" information in order to provide the high volume, low cost product to the differentiated market. To be able to provide this information, a well managed process must exist that delivers this to the business entity. This then becomes the mission of the information delivering secondary process. In order to achieve this, the business strategy must be clear regarding its direction in the short to long term. To provide this, information technology plans must be devised and executed to support this strategy. This function must be staffed, infrastructure put into place, operated and maintained.

The management of capital in this process alone is a time consuming task[1]. The business entity then, is faced with a dilemma. It is in business because of its core competency of producing the right chickens in the right place at the right time. It does not have the correct knowledge and energy with which to run this process to its full potential. This is unless the business is able to continuously part with the huge amounts of capital required to maintain this process. It must be noted that a secondary process, being part of a business entity, cannot normally recover costs from outside the business system. All costs will therefore accrue to the real value of the product, which, as discussed earlier, may not be compatible with the customers' perceived value. The business is therefore faced with two alternatives, either it manages the process directly from within, taking the feasibility into account, or it outsources the process [34,6]. In either event, the value of the decision as well as the risks need to be identified and managed accordingly.

In the second example, the business would require much packaging material in order to present the product to the customer, in its various forms. The business would then be faced with the same decision as with the IT process. The decision should again be based on the holistic long term benefits and risks of the solution.

The value chain approach allows the business to align its operations with what makes meaningful business sense. It can easily identify if differentiation is taking place and whether this is appropriate.

In addition to providing business focus, the value chain approach can be used as a means of forming ideas on how transformation should be undertaken. Non-value adding activities can be identified for possible elimination, secondary, non-core activities may be outsourced while gaps between processes can be identified. In analysis, this facilitates the ability to identify risk areas in transforming the processes.

There are however shortcomings in the value chain approach, its simplistic nature being the major factor. It is difficult, if not impossible to model most organisations in a linear fashion due to the complicated requirements of business. The interaction with the external environment of the business is not dealt with by value chain analysis. The next step was to incorporate the value chain into the value system [35], i.e. the system of organisations and production factors working in synergy to provide product to the customer provided this perspective. While it did provide the ability to understand the roles of organisations (sub-systems) within the system, the inherent linearity of the value chain limits analysis of the richness of the systems concept, such as the network of interactions and multiple feedbacks.

To better utilise systems theory, Normann and Ramirez [36] provided the concept of the value constellation. In this model, activities are still evaluated based on the value brought to bear, but the linearity is set aside for a network approach. This provides for the ability to process simultaneously, in parallel, sequentially, and by different process elements. This approach allows for a range of possibilities (and hence risks) in which a business or businesses can be transformed. The concept of the value constellation brings into question, the reasons for traditional organisational boundaries as it advocates fluidity and flexibility in any direction.

[1] This example illustrates the situation typically experienced by a medium to large organisation. It is seldom that a 1 to 10 person company need to go through the rigours to this extent.

While it does reduce the need for traditional control due to the transparency of tasks ensuing from the close integration that occurs, its inherent fluid properties provide management difficulties.

In order to manage this value constellation satisfactorily, Ashkenas et al [37] provide a means of setting boundaries and analysing the effects of making certain boundaries more permeable. The authors identify four different types of barriers, namely vertical, horizontal, external and geographic.

They further advocate that vertical barriers need to be broken down via the distribution of authority throughout the organisation, information shared openly and rewards tied to the accomplishment of that position. Taylor [40] proposes that some failures of BPR have resulted from leaving much of the traditional hierarchy in place, particularly the reward structure.

Ashkenas et al view the horizontal barriers as those boundaries between business functions. Rayport and Sviokla [38] provide a means of achieving this in their virtual value chain concept. They describe a matrix of value chains where the traditional value chain [33], called the physical value chain coexists with virtual value chains. These are termed virtual as they do not take physical form, they facilitate the processing of information to provide competitive advantage. This can lead to the changing of products, services and even markets.

2.5.3 Process and functional paradigms

Since the advent of the surge of work around BPR theory, much has been discussed regarding the process versus the functional approach. Hammer [39] in particular, describes the requirements of the process paradigm as contrasting significantly to that of the functional paradigm. The concept of the functional approach can be attributed to the school of scientific management [40].

The basis of the process approach is to focus on providing value based desired results, not on work. This theory has been adequately expanded by the early proponents of BPR [5,39,41]. The change from process to functional bring the core paradigm of change in BPR which needs to be managed carefully. Sometimes activities have been embedded in functions that make limited apparent reason on initial analysis. The risks in transforming mind set and work need to be addressed accordingly.

2.5.4 Production factors

In order to produce income, the business system needs to add value by transforming resources into a form that a client or a customer is willing to pay for. This payment or exchange is aligned with the accumulated value (CNV[PE_i]) for the product or service. The resources absorbed or transformed in the processing that takes place are termed as production factors by economists. Lombard et al [42] have categorised the four general groups of production factors as follows:

- Labour.
- Natural resources.
- Capital.

- Entrepreneurship.

Other authors [26] have added methods, machinery and energy to the list. Bosman and Moll [27] have included information to the list as a factor becoming increasingly more valuable in conducting and transforming business today. Information is however only the middle tier in the data, information, knowledge hierarchy. Recent research [43] has shown that the successful management of an organisation's knowledge assets aligned with strategic objectives will provide one of the drivers of success in the future.

2.5.5 Productivity

The Oxford dictionary defines productivity as:

"Capacity to produce; quality or state of being productive, production per unit effort; effectiveness of productive effort"

In simple terms productivity is simply given by the following equation:

Equation 2

$$Productivity = \frac{Output}{Input}$$

Mundel [26, p1.5.1] provides a more formal definition of productivity as the:

"ratio of outputs produced for the use outside an organisation, with due allowance for the different kinds or products, divided by the resources used, all divided by a similar ratio from a base period. Hence it is an index; it has no dimension."

Productivity in its component sense is seen as the product of effectiveness and efficiency, where:

- Effectiveness is doing the right things.
- Efficiency is doing things right.

This is illustrated in Figure 9 where the objective is to achieve goal B from point A.

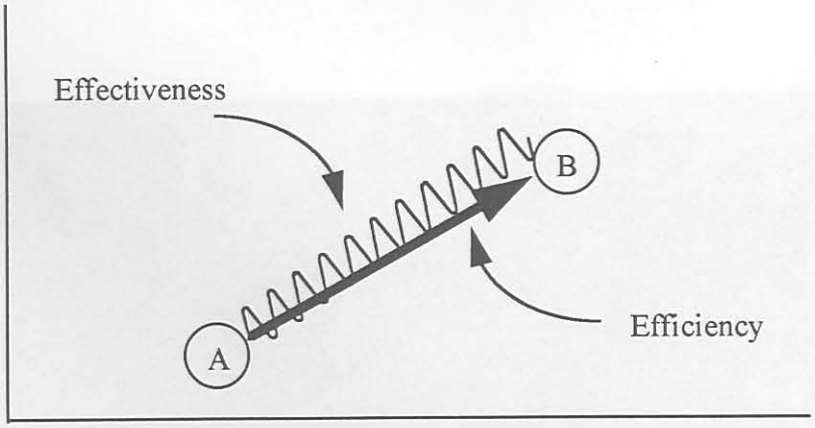


Figure 9 - Relationship between Effectiveness and Efficiency

From the figure, chasing the shortest path means achieving the goal effectively. Depending on how frugally (burn rate) this is achieved, is a matter of efficiency (thickness of the line).

Ackoff [59, pp50-52] describes the relationship as follows:

"Science, technology and economics focus on efficiency, not effectiveness. The efficiency of a course of action relative to a possible outcome in a specified environment is measured in one of two ways: either the probability that it will produce that outcome in that environment, or the amount of resources it consumes in producing that outcome in that environment. ... The effectiveness of a course of action in a specified environment is a function of its efficiency for each possible outcome and the values of these outcomes to those affected by them."

2.5.6 Business drivers

Business drivers pertain to those forces that are directly or indirectly shaping the future of the business. These forces may either be internal or external in nature. The business may or may not have the ability to influence or coerce the direction of these forces. These drivers can therefore change the state in which the business resides either knowingly or unknowingly and may have a negative or positive impact on the business.

Examples of internal drivers include the need to improve the safety of working conditions, and external drivers, the pressure by government to implement affirmative action initiatives.

2.5.7 Benchmarking

The concept of benchmarking has been used for many decades in the engineering environment where it has been used as a calibration mechanism for manufacturers of vehicles, electronic equipment and so on. This approach for the search of "best-in-class" performance has been adopted by business improvement practitioners over the last decade. Various formal definitions of business related benchmarking exists, but there is sufficient consensus however, over the generic standard setting attributes and mechanisms that strive to achieve this. McCarthy [44, p10] using Spendolini's model for defining benchmarking [45], proposes the following definition which incorporates contemporary thought on business related benchmarking:

"A continuous, systematic process, for comparing business practice of organisations that are acknowledged as world class for the purpose of organisational improvement."

Various types of benchmarking exist, being categorised in a way meaningful to the attainment of the practitioner's specific goals. Types of benchmarking that take place include product, process, cost, structure, functional, competitive, standards based, etc. Miller et al [46] however, provide an organisational hierarchy based framework that provides insight into this sort of categorisation, as well as what can be achieved by each. This is shown in Figure 10.

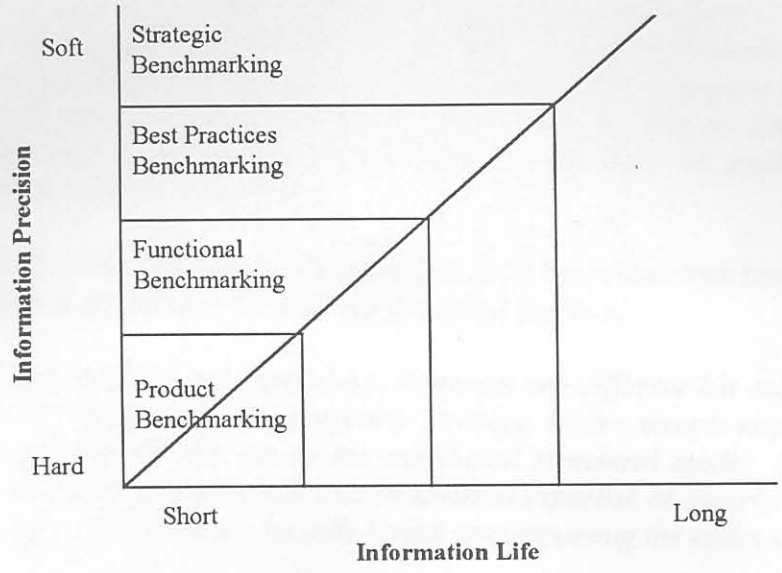


Figure 10 - Benchmarking Hierarchy and Effectiveness

From the literature, various benefits result for the business, these include:

- Having an external focus.
- Understanding the pressures of "world-class" requirements.
- Aligning the organisation with market driven needs.
- Pro-actively sets a course for organisational improvement.
- Promotes transparency of measures and targets for all throughout the organisation.
- Provides a positioning indicator of the organisation's health in terms of customer orientated and competitor demands.

These benefits are however, offset against certain disadvantages. The most important of these include:

- A ceiling effect results from trying to only achieve contemporary best practice.
- Creative aspects and doing things radically different are not easily promoted.
- Focus on subsystems (e.g. functional compared to strategic benchmarking) may result in sub-optimal solutions or may even pull in different directions. For example "best-of-breed" practice in functions may result in disjointed or mis-aligned processes or exercises.
- Making your own benchmarking information available could have a hollowing effect on competitive advantage.
- Establishing "precise measures" can be time consuming. If incorrectly done, it could lead to false targets and accordingly mislead behaviour.
- The initial costs in setting up a benchmarking process can be high without yielding immediate results.
- Another management improvement "fad" to deal with in organisations already tasked (either successfully or unsuccessfully) with a host of improvement initiatives.

2.5.8 Core competencies, capabilities and competitiveness

The hype of strategic planning has waned. Mintzberg [47] has indicated that managers have confused real vision with the manipulation of numbers. The value of strategy remains in the vision it engenders, not the development of hard plans. This is a reason why scenario planning is proving to be increasingly more valuable.

With the population and the variety of management techniques, it is the researcher's experience that "once this has been implemented, we will be there" unfortunately the business environment is constantly changing. A question arises, inquiring about solution sustainability. The concepts of core competencies and capabilities suggest a focus for addressing this. Hamel and Prahalad [6] define core competencies as:

"... the collective learning in the organisation, equally how to co-ordinate diverse production skills and integrate multiple streams of technologies ... is also about the organisation of work and the delivery of value ... is communication, involvement and a deep commitment to working across organisational boundaries ... Core competence does not diminish with use. Unlike physical assets which deteriorate over time, competencies are enhanced as they are applied and shared. But competencies need to be nurtured and protected; knowledge fades if not used ... They are also the engine for business development. Patterns of diversification and market entry may be guided by them, not just be the attractiveness of markets."

Until 1992, the terms competencies and capabilities had been used interchangeably. Then Stalk et al [48] put forward the following position:

"*Competencies and capabilities represent two different but complementary dimensions of an emerging paradigm for corporate strategy. Both concepts emphasise "behavioural" aspects of strategy in contrast to the traditional structural model. But whereas core competence emphasises technological and production expertise at specific points along the value chain, capabilities are more broadly based, encompassing the entire value chain.*"

Long and Vickers-Koch [49] define the relationship as shown in Figure 11.

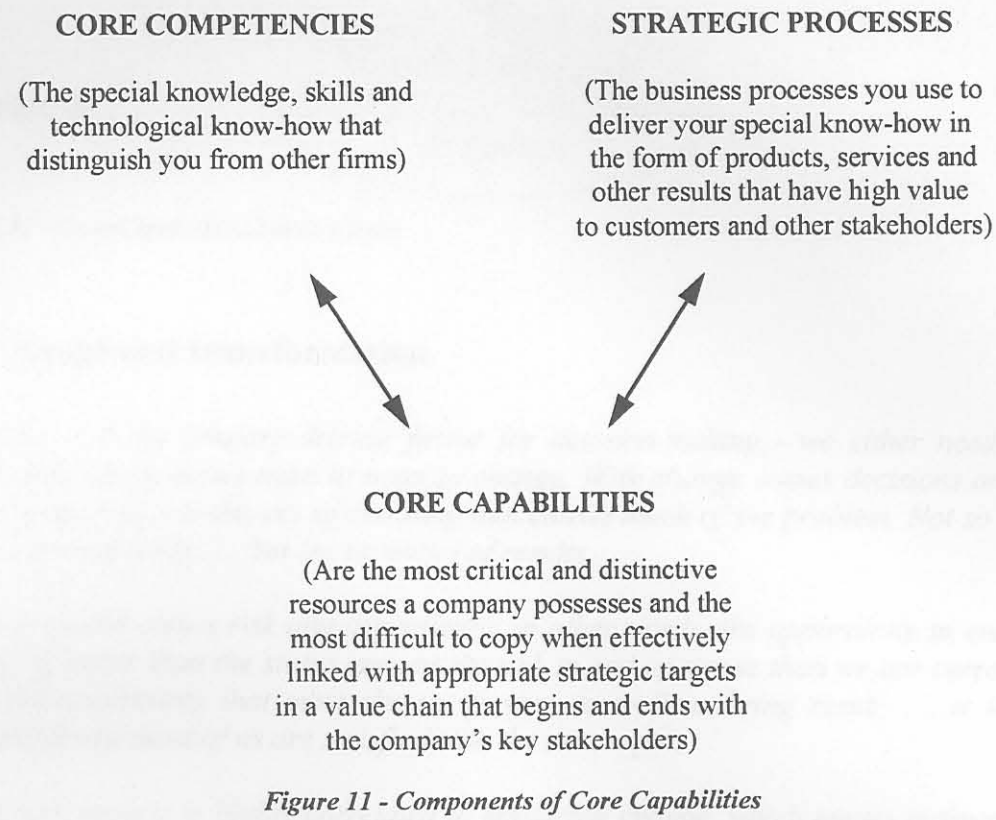


Figure 11 - Components of Core Capabilities

The authors indicate two prerequisites in order to become capabilities based. Firstly the value chain should be evaluated for areas where the margins are greatest between what the value stakeholders place on what is added and the cost of adding it. Secondly the processes and feedbacks need to be modelled and special capabilities identified supporting the stakeholder needs. The authors illustrate the core competencies value chain in Figure 12.

This analysis plays a very important role in understanding the core composition of a business and accordingly plays a pivotal role in analyses orientated around competitiveness. Reasoning around this is included as appendix H.

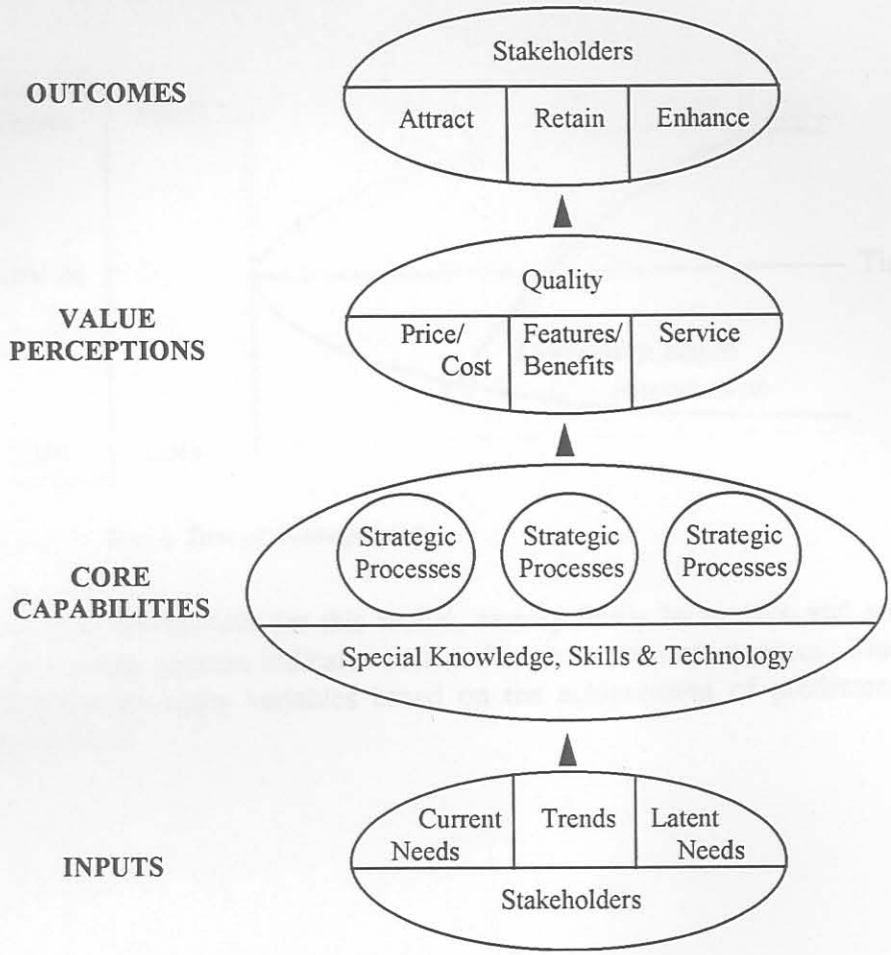


Figure 12 - Core Capabilities Value Chain

2.6 Change and transformation

"Change ... is the primary driving factor for decision-making - we either need to make change take place, or we need to react to change. With change comes decisions and the act of choosing. And it is this act of choosing that causes much of the problem. Not so much the act of choosing itself, ..., but the potential of results.

For with choice comes risk and opportunity: in other words, the opportunity to end up with something better than the status quo, or the risk to end up worse than we are currently. And given the uncertainty that most choices posses, as well as bring result, ..., it is easy to understand why most of us are satisfied with the status quo.

... Business success is highly correlated to managing change, which means making choices, which means understanding risk and opportunity."

Charette [10]

Change emanates from the need to improve a current set of circumstances. Transformation is facilitated through a change in form, whether it be outward appearances and or the intrinsic characteristics thereof. Change does not necessarily mean that circumstances will improve, the

reverse is also true. While it is the task of management to achieve the business goals, one of the functions to ensure this is to pro-actively embark on a path on continual[1] improvement.

Scott-Morgan indicates that there are four dimensions of risk, namely:

- Success rate.
- Speed of change.
- Magnitude of change.
- Parallelism (of change initiatives).

He indicates that the task of the successful organisation of the future will be to successfully manage the portfolio of change initiatives within the organisation, each with their own risk-reward profiles.

It is the task of managing the risks in business change to ensure that change is enacted in a positive and not a negative form. Figure 13 illustrates this concept.

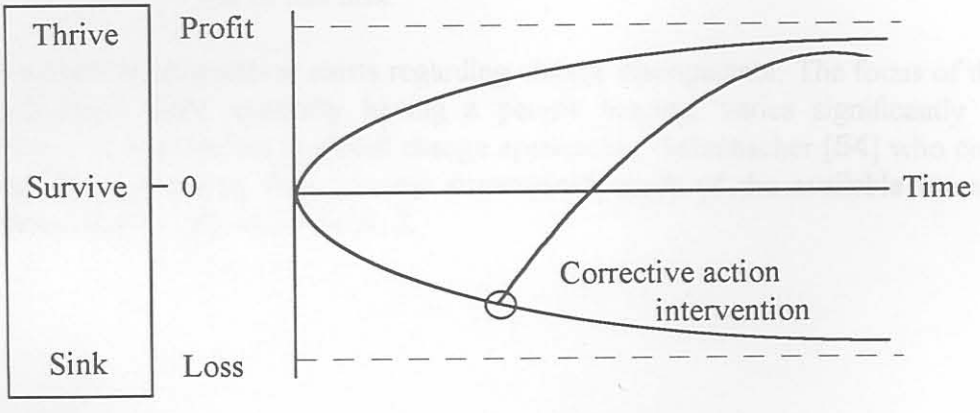


Figure 13 - Macro Task of Management

Two imperatives hold for this model, namely firstly to survive and secondly to thrive. The improvement process indicates that a change in state must occur. This change in state will affect one or many variables based on the achievement of predetermined goals. Consider Figure 14.

[1] This incorporates the concepts of continuous and dramatic improvement initiatives.

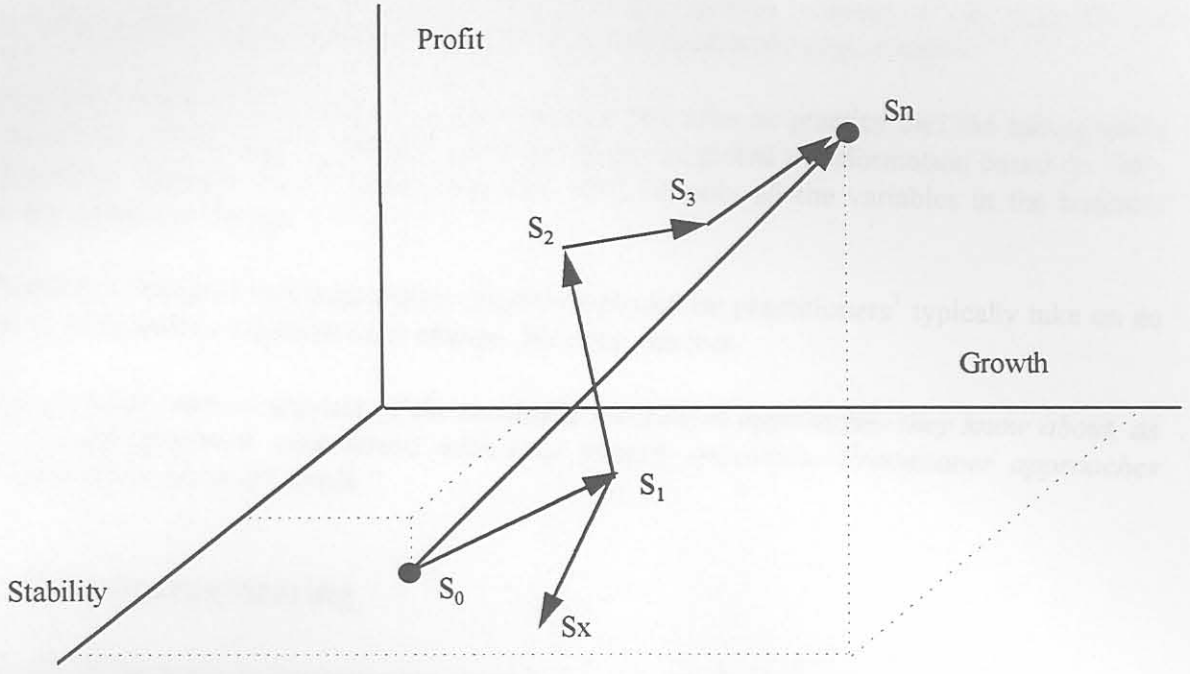


Figure 14 - Transformation in Business State

Figure 14 indicates the three components that need to be addressed in order to achieve the aims of the business as described earlier. These include the money-making focus, supported by the imperative of sustainability. The money-making aim is achieved via striving for profit and growth while the latter is supported by the combination of stability and growth.

Profit is measured by traditional means, growth is a function of typically economic value added (EVA) [50], while stability is measured by appropriate factors such as market share, acid ratio, debt to equity ratio and the like.

As Figure 14 illustrates, the goal can be achieved via maximum effectiveness ($S_0 \rightarrow S_n$) or via a set of sequential actions that ultimately result in the desired state. The task of risk management is to ensure that the transition chain ($S_0 \rightarrow S_1 \rightarrow S_x$) does not occur, or if it does occur, that the net effect is minimised. In many business improvement projects the requirements are well analysed and the desired goal S_n (the what) defined, but often never actually result [51,52,53]. The management of change through to implementation and operation is the rest of this task.

A wealth of information exists regarding change management. The focus of the literature and techniques while generally having a people bearing, varies significantly from individual orientated approaches to global change approaches. Schumacher [54] who conducted a study into the barriers to BPR success summarised much of the available literature on change management as shown in Table 2.

Table 2 - Classification of Change Management Approaches

	Individuals	Groups	Organisation	Environment
Psychology of the individual				
Social psychological approaches				
Cultural approaches				
Innovation approaches				
Global change approaches				
Practitioner approaches				

From Table 2, psychology of the individual deals with the individual person [54] where the character and the process of the change are the primary concerns.

Socio-psychological change is based largely on the premise that the individual is shaped more by the social environment than by their genes. The author put forward that culture is mostly unconscious to the members of the organisation even when new behaviour is required. He further indicates that

"this is one of the reasons, why new leaders introducing change in an organisation sometimes replace key positions with new people, external to the organisation."

Innovation approaches focus on the diffusion of a new idea or practice and the management of resistance to this. Global change approaches focus on global transformation based on "life-threatening" changes. These approaches deal with virtually all the variables in the business that are subject to change.

Schumacher indicates that approaches usually employed by practitioners[1] typically take on an eclectic approach to organisational change. He observes that

"they combine various aspects of the available theoretical approaches they know about, as well as add practical experiences with real change processes. Practitioner approaches typically intervene at all levels."

2.7 Business engineering

The task of the business improvement practitioner is to develop means of making a difference to the so-called bottom line of the business. Considering a generic system (Figure 3) and the value chain (Figure 8), there are four general ways in which the change to the bottom line can be made, namely:

- Changing the inputs.
- Improving the process.
- Improving the support infrastructure.
- Changing the system framework.

[1] He defines practitioners as consultants and managers.

Martin [55] purports that there are 5 disciplines involved in instituting change in a business aimed at improving its financial attractiveness[1]. These are:

- TQM, kaizen.
- Procedure redesign.
- Value-stream reinvention.
- Enterprise redesign.
- Strategic visioning.

The researcher however believes that another factor, namely financial optimisation is used to change the financial attractiveness of a business. Martin's definitions as well as the last-mentioned are summarised in Table 3.

Table 3 - Change Types Aimed at Business Improvement

Type of Change	Description	Example of Techniques	Business Results
TQM/ kaizen	The lowest level of change, kaizen creates a culture of continuous improvement. Often applied to a process, it can also involve a succession of small improvements to a wide range of elements, including products, manufacturing, modelling and selling, etc.	Workstudy, statistical methods, TQM, benchmarking, quality circles	Improvement in efficiency, quality
Procedure redesign	A middle-ground between the gentle continuous change of kaizen and the scrap-and replace upheaval of value-stream reinvention, procedure redesign alters existing procedures.	Process redesign, benchmarking, problem-solving, cost-cutting, TOC, ABC, ERP, JIT	Improvements in efficiency and effectiveness to a degree.
Value-stream re-invention	Identifying and replacing end-to-end processes that meet a customer's needs in order to serve that customer as effectively as possible. Invariably involving organisational change, it usually results in time and cost savings while improving quality and service.	BPR, technology management, rightsizing, benchmarking, product changes, value engineering, costing approaches	Improvements in efficiency and effectiveness, quality, overheads
Enterprise redesign	Concerned with the holistic redesign of the enterprise, enterprise redesign can be done by re-engineering existing organisations or by building new business units, factories, subsidiaries or affiliates.	Strategic alliances, portfolio management, corporate restructuring	Improvements in effective-ness, leverage, focus, increase in turnover and market share
Strategic visioning	Strategic visioning guides a corporation and shows where it is going. Of the comments of	Strategic management, core	Improvements in focus,

[1] He indicates that there are two further infrastructural change processes, namely (1) information technology development and (2) organisation and culture development. These can be likened to the secondary change processes which are required for the primary change initiative to succeed, while the former 5 are the options for the primary change process.

Type of Change	Description	Example of Techniques	Business Results
	"enterprise engineering", it is one that is unique to each enterprise.	competencies and capabilities, portfolio analysis	income stream, reduction in risks, increased leverage
Financial optimisation	Change in the financial characteristics of the organisation, e.g. financing via listing as a public company or taking advantage of tax-breaks, etc.	EVA, restructuring investments, financing options, "financial engineering"	Reduction in cash-outflows, improving financing of operations. Improving "ROI"

All six types bring about change in the way business is conducted, with a view to improving the "bottom-line" of the organisation. The last factor, namely financial optimisation, does not necessarily experience the same behavioural risks due to its use of financial instruments rather than predominantly human nature. The scope of this study is therefore limited to the first 5 types of business change. When financial optimisation techniques are relevant, where evaluating initiatives in the other five areas, these will be discussed. The same rationale is used for the infrastructural changes described by Martin.

It is therefore understandable that when a new business improvement technique emerges that people in the organisation become either confused or exasperated in terms of what to do next, and how this fits into the whole scheme of things. While there is solid motive around developing business theory, implementers are quick to exploit this, without necessarily understanding the fundamentals. This then quickly becomes a management fad without accumulating in an integrated fashion to the solid body of knowledge already available. Rigby [56] claims that a management theory has a life cycle consisting of six phases, listed as follows:

- **Deficiency**. Inattention to an important principle or change in conditions leads to a desire to change the status quo.
- **Discovery**. Creative thinkers develop (or dust off) solutions to correct the deficiency.
- **Euphoria**. Early success stories are highly publicised, lowering barriers to trial.
- **Over-extension**. Excessive application in inappropriate areas result in failure or less than expected results.
- **Derision**. Examples of failures become vociferous and critique becomes the order of the day.
- **Abandonment**. Businesses discard the technique and replace it with a more novel and fashionable approach.

While this is clearly a sceptical view of management theory describing them all as fads, it is the researcher's experience that this is how techniques have been received in many instances. The problem with being regarded as a fad implies that once the novelty has warn off, it is discarded and often ends up being taboo.

Bosman and Moll [27] however, believe that all management theories contribute value and must be evaluated and applied with appropriate discretion. It is only from understanding the fundamentals of business on the one hand, and the techniques available on the other, that appropriate selection and application can be made. In this way inherent benefits and risks can be identified and managed correctly.

The authors identify the concept of business engineering as providing the framework for the appropriate means of improving a business entity. The term analyses the constituents and explores the means for achieving the goals of business through the application of engineering-like principles to business. The concept of business is as defined earlier. The engineering approach is considered to be constituent of:

- Having a wealth of scientific tools (mathematics, physics, etc.) at ones disposal.
- Possessing a logical deductive as well as inductive reasoning ability.
- Having formal solution providing processes and frameworks.
- Possessing the ability to be creative and innovative.

The authors incorporate the principles into the (modified) model shown in Figure 15.

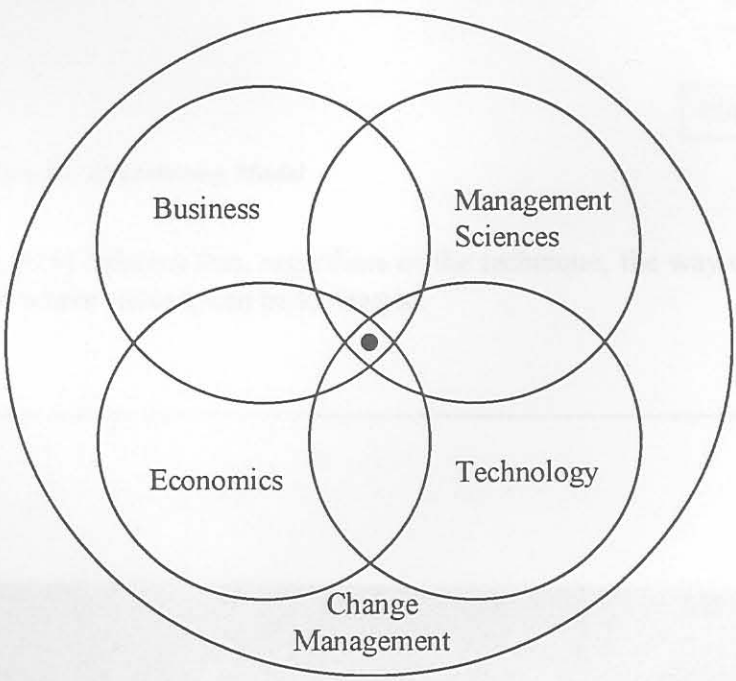


Figure 15 - Daisy Model - Principles of Business Engineering

From the figure, business, management sciences, economics and technology are fields where techniques/understanding can be drawn from, with the prerequisite that they are appropriate. The solution is seeded through the innovative ability and the change managed from inception through operation.

Watson [57] supports this approach where new approaches should not be immediately embraced, but well founded. He however expands on the term "business systems engineering" where the focus is on the systems approach while integrating the concepts of BPR and TQM. He adds that the advantage of building on theory that is already familiar, finds allies who can

readily accept the methods and therefore more willing to focus on delivering the desired changes. The author does not however provide the ability to bring improvement to bear in all possible areas as described in Figure 15. It focuses primarily on bringing about bottom-line benefits by working in the areas of process improvement, strategic enablers, products and technology. His business systems engineering model is shown in Figure 16.

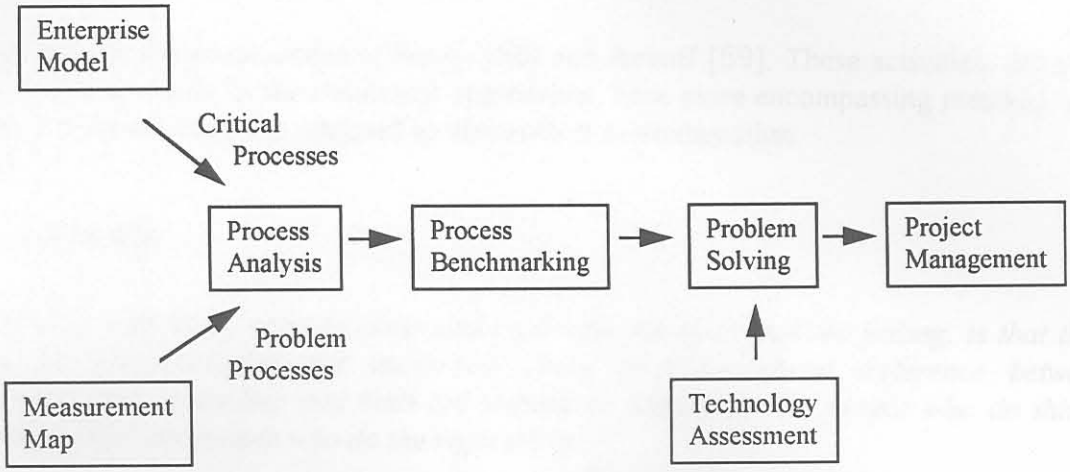


Figure 16 - Watson's Business Systems Engineering Model

From an engineering view point, Bosman and Moll [27, pp22-27] propose a generic engineering model shown in Figure 17. The generic phases of planning, analysis, design, construction, implementation, operation and phase-out can also be applied to non-traditional engineering environments as well, such as the redesign of a company's core processes.

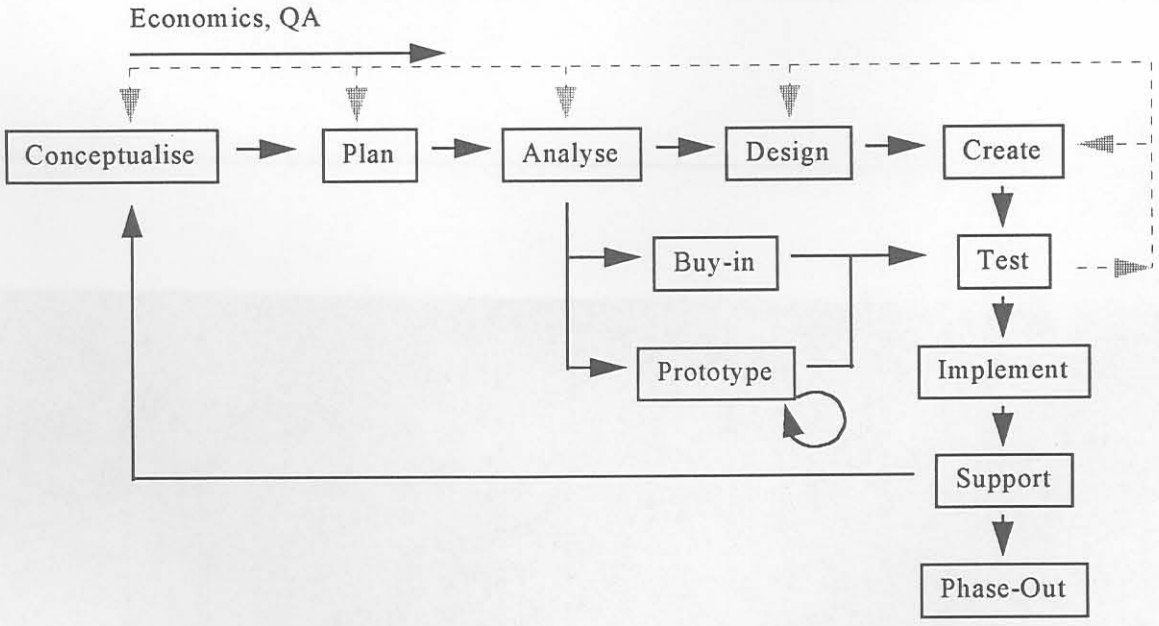


Figure 17 - Generic Engineering Model

Scott-Morgan [51, p11] believes that, regardless of the technique, the way change is brought about is the crux of where success can be leveraged:

"Since the start of the 1980s there has been a new wave of management thinking. TQM, intrapreneuring, downsizing, management by walking around, empowerment, one minute managing, teamwork, re-engineering, customer focus, learning organisation. The common denominator of all these new wave approaches is that to work they all require that we ***change the way people behave.***"

2.8 Management

Several authors describe their techniques as risk management, where in essence, what is being described is only one important part of the management task, such as analysis. Traditionally four key functions of management where the full life cycle is implied, namely planning, organising, leading and controlling have been purported

This infers a parallel to the complete cycle in business change; from inception, through analysis, execution, monitoring, operation and phase-out. Considerable time is however spent on the planning function as this makes the execution of the other functions easier.

Champy [83] identifies the following activities as being relevant for the management tasks of the re-engineered manager, namely:

- Mobilising.
- Enabling.
- Defining.
- Communication.

This ties in with the propositions of Senge [58] and Ackoff [59]. These activities, although having the same words as the traditional approaches, have more encompassing meaning, e.g. interactive communication as opposed to hierarchical communication.

2.9 Leadership

"*The problem with many organisations and especially the ones that are failing, is that they tend to be over-managed and under-led. There is a predefined difference between management and leadership and both are important. Managers are people who do things right and leaders are people who do the right things.*"

Bennis [60]

This puts forward the view that draws a metaphor between managers and efficiency and leadership and effectiveness.

A wealth of literature exists that describes the various leadership models from contingency models to situational models. Some of these even date back to the 1930's. One of the most appropriate descriptions of leadership in the context of what is required in business today is

provided by Ball and Asbury[1] [61, pp184-207]. They describe leadership in terms of what they do as well as elaborate on the attributes of the outstanding leaders. These components are listed in Table 4.

Table 4 - The Behaviour and Attitudes of Leaders

Leadership Behaviour	Attributes of Leaders
• Leaders drive their organisations. • They inspect their environment. • They generate excitement. • Leaders get down to the coal face. • They blaze trails (entrepreneurial). • They make explicit and high demands. • Leaders have a strong vision. • They make meaning: power of language. • Leaders communicate. • They draw excellent people around them.	• Strong character. • Ambitious. • Bold attitude towards risk. • Disciplined. • Strong people orientation. • Committed almost to the point of obsession. • Consistent. • Expert in his/her field. • Intellectual as well as emotional.

The authors further indicate a 10 step approach to "inspired leadership". These are:

- Develop a powerful vision of the organisation that embodies an invincible business concept and which captures the imagination of the people in the organisation and makes meaning for them.
- Get into the driving seat, grip the steering wheel and put your foot down. It is the leader who sets the energy level and pace of the organisation.
- Get to know the coal-face, get down to it and inspect it.
- If your organisation does not excite you, bail out. Otherwise show your excitement to all around you. It is infectious. So is apathy.
- Demand the performance your people are capable of. The chances are that they are more capable than you give them credit for.
- Blaze the trail into new areas of opportunity.
- Make meaning for the people in your organisation.
- Communicate, communicate and communicate.
- Draw people around you. The power of even the most impressive person is dwarfed by the power of a team that "hums".
- Disregard the macho type who believes that feelings and attitudes do not matter. They are the bottom part of the iceberg. Understand them and engage the heart and "gut" as well as the head.

[1] This research was conducted in South Africa to establish the components of inspired leadership by the super performers.

2.10 Uncertainty and risk

"Certitude is not the test for certainty. We have been cocksure of many things that were not so."
Justice Oliver Wendell Holmes

Most authors [31,62,63,64] have differentiated risk and uncertainty as follows:

- **Risk** - when historical information (probabilities) does exist in order to describe the execution of future events which could result in a loss or gain in wealth, damage, injury or other consequences that deviate from the likely norm.
- **Uncertainty** - when this information is not available to describe the likelihood of future events.

Hertz and Thomas [64] extend the concept of risk beyond the lack of predictability of outcome. They include all elements of problem structure including the relevance of assumptions, the generation of strategic alternatives, the level of organisation information about the problem, the importance of consequences and the ability to achieve organisational goals.

If an undesirable action is certain, then this is not a risk. This is a problem.

2.11 Management of Risk

Various literature sources reviewed in this study described the importance of their analysis approach in managing risk. While sound analysis promotes the reliability of dynamic variables, it is only one component of the risk management task, This is implied by the definition of management provided earlier.

Frigenti and Kitching [62, p32] propose that:

"risk management is the systematic approach whereby the specific source (not the cause) of risk is identified and represented in order to minimise (project loss) or maximise (project gain) the impact on the achievement of the project's scope, organisation, time, cost and quality parameters."

This definition refers to the project management environment, but the same inferences can be drawn to the business change environment (this seems reasonable since most initiatives exist in project form as well). It may however be noted that this definition refers to the assessment activities and does not address the entire management task.

Charette [10,65,66] provides a comprehensive understanding of what the management of risk is and suggests an approach for the risk management process. The remainder of this section is based on this work.

2.11.1 Management of risk

Based on research conducted in the USA and Europe, two critical success factors exist for ensuring business performance. These are:

1. Minimising uncertainty
2. Maximising stability and predictability

Uncertainty exists in 3 general areas in the organisation, namely:

- **Operational information** - information needed to make decisions concerning the business. This involves from the operational level through to strategic.
- **Operational control** - relates to the degree of influence a business has over its own destiny due to internal or external interventions. The less operational control a company has, the more it can be influenced by others.
- **Operational time** - determines the turn-around time between internal or external stimulus and the business response.

Stability involves achieving alignment between actions and resources, while predictability involves the learning ability of the organisation and to direct this in adapting appropriately to change. Achieving the two critical success factors requires the understanding of the relationship between risk and opportunity. This is facilitated by Figure 18.

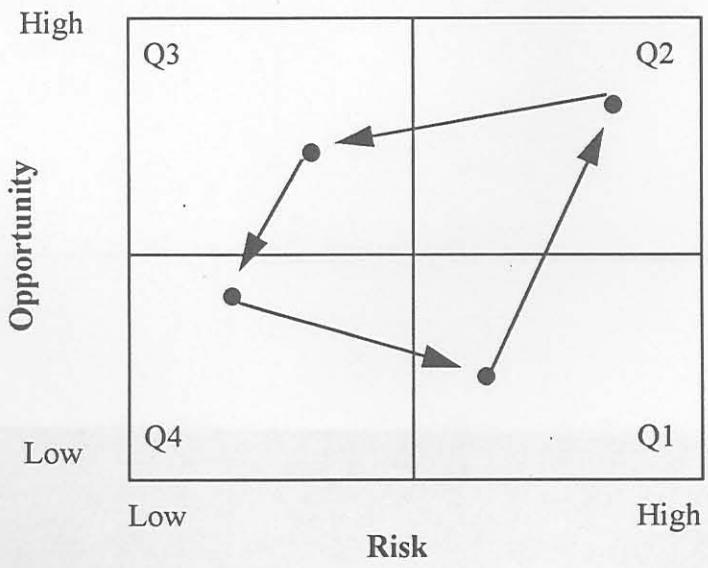


Figure 18 - Charette's Risk-Opportunity Combinations (Modified)

There is a continuous trade-off between risk and opportunity. New markets begin in quadrant 1 where risks are high and the opportunity low. A breakthrough in technology or process allows the move to quadrant 2 where high risks are accompanied by a high level of opportunities. As the market stabilises it moves to the cash cow (BCG matrix analogy) position (quadrant 3). As the market becomes more competitive it moves to a low opportunity as well as low risk situation. Being a cycle, the loop is recursive. It is important to note that risk precedes opportunity.

It follows that the business that can best minimise uncertainty is best positioned to manipulate this risk/opportunity cycle to their own advantage. Charette proposes the risk helix as shown in Figure 19 as a means of providing an understanding of the nature of the management of risk.

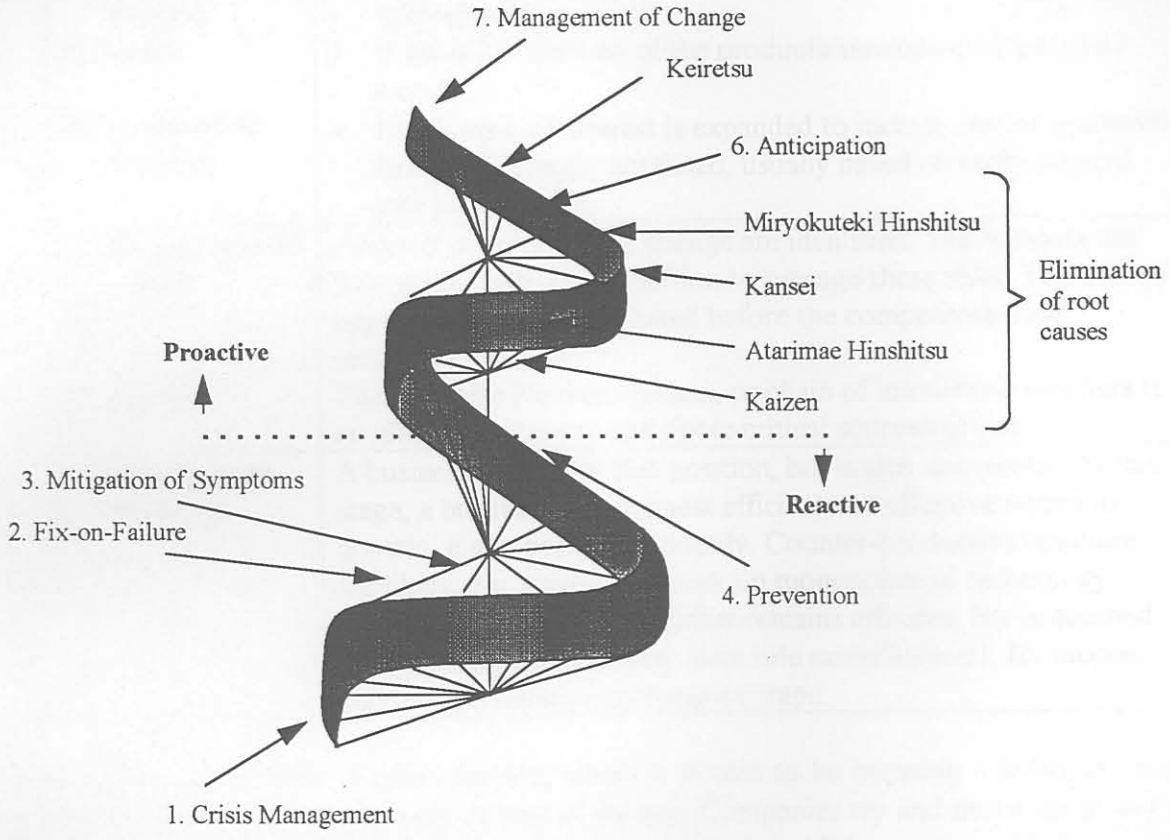


Figure 19 - Charette's Risk Helix

There are two different approaches to managing the risk/opportunity cycle (Figure 18). These approaches set the initial conditions that eventually govern the degree of both. These two approaches are reactive as opposed to proactive. Each of these approaches have stages which themselves rank in degrees as illustrated in Figure 19 (stages 1 to 4).

Table 5 describes each of these stages in terms of the effectiveness in the management of uncertainty in the business environment.

Table 5 - Description of Stages in the Risk Helix

Approach	Stage	Description
Reactive	1. Crisis management	Failure occurs faster than the organisation has the ability to deal with them. There is extreme uncertainty, instability and unpredictability. These companies are fighting for survival, being susceptible to competition.
	2. Fix-on-failure	It assumes that as each risk (or combination of risks) occurs, the resulting consequences can be repaired without significant impact. To operate here, planning must match reality. Most businesses today operate in this stage.
	3. Mitigation of symptoms	This is providing a contingency to cover the potential consequences of a risk's occurrence. This is feasible if the planning is within the projected limits of uncertainty. If this does not happen, then the fix-on-failure stage will become valid.
Transition	4. Prevention	This is typically the starting point of a business journey through the helix. Actions are taken to prevent the occurrence of the risk(s). In reality, risks will occur; the choice is either a reactive or proactive approach to the management thereof.
Proactive	5. Elimination of root causes a) Kaizen b) Atarimae hinshitsu c) Kansei d) Miryokuteki hinshitsu	BPR is one means of achieving this. Future variations are constrained by business processes that are (1) visible, (2) measurable and (3) repeatable. If these do not hold, then the business will slip into reactive mode. • Continuous process improvement. • The process' domain of interest is increased by addressing the "intangibles". • "5 senses". The user of the products/services are taken into account. • The domain of interest is expanded to include sets of processes that are seemingly unrelated, usually based on technological core competence.
	6. Anticipation of change a) Keiretsu	Areas of possible future change are identified. The business can then place itself into a position to manage these risks. This allows opportunities to be exploited before the competitors even perceive them. The Japanese Keiretsu system, or chain of interlinked suppliers is an effective means to anticipate critical sources of risk.
	7. Management of change	A business strives for this position, but is also dangerous. At this stage, a business is at its most efficient and effective within its domain, e.g. a perfect monopoly. Counter-productive reactions are likely, e.g. actions to break up monopolies or technology changes where the local market remains efficient, but is doomed to eventual extinction (e.g. slide rule manufacturer). Its success may also be blind to competitive traps.

The metaphor of the helix is taken further, where it is said to be spinning - indicating that much energy is required to move up or stay at the top. Companies try and move up or move their competitors down to a more favourable quadrant. In addition to competitors, other

factors like technologies, currency fluctuations, political impositions, etc. affect the behaviour of the helix as well. The shape of the helix is also dependent on the quadrant. In new markets, the helix is tall and thin, rotating very fast. In mature markets, the opposite is true.

2.11.2 The risk management process

Charette draws a distinction between the management of risk and the risk management process. He indicates that the management of risk implies:

"a systemic, holistic and/or multi-disciplinary approach to risk and its management, one which weaves elements of cost management, project management, security management, quality management, etc. into a unified whole."

The risk management process in contrast is however concerned with:

"a phased, systematic approach (possibly implemented through a unique tool or technique) to the analysis and control of risks occurring within a specific context."

In practical terms a manager may employ a risk management approach to a change action. To achieve this, one or more risk management processes may be employed. This could be interpreted as management of risk implying an organisation's philosophy while risk management implies method. The risk helix (Figure 19) pertains to philosophy.

The risk management process can be decomposed into two distinct areas, namely the risk analysis activities and the management activities. The literature generally uses the same approach in describing the components of each. Charette, however provides the relationship shown in Figure 20.

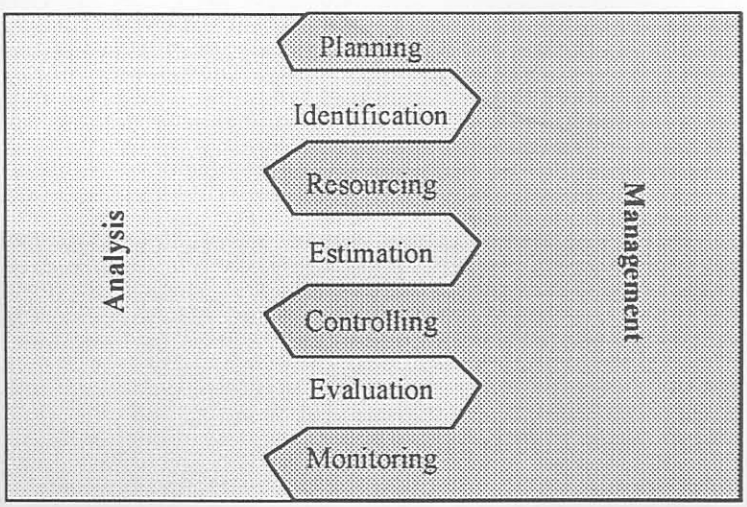


Figure 20 - Charette's Risk Analysis and Management Process

From Figure 20, it is clear that the risk management process is inextricably linked with the decision-making process. The nature of these components is summarised in Table 6.

Table 6 - Description of Risk Analysis and Management Components

Phase	Activity	Description
Analysis	1. Identification	Its goal is to find and describe all the risks that may exist. The correlating opportunities are also established. Top-down and bottom-up search techniques are employed.
	2. Estimation	Actions include estimating likelihood, consequences, timing, profiles, relationships, the value of the effort required to improve them and the prioritisation[1] [67] of these risks.
	3. Evaluation	This process means evaluation of the risks against a referent or level of acceptability, i.e. is the risk acceptable? Acceptability infers that it will not impact on current plans. If so, alternatives must be generated. This is an iterative process that may link back to identification. The critical element of this process is setting the level of risk acceptability.
Management of implementation	4. Planning	Once the analysis is complete, a decision is taken as to the appropriate course of action to be implemented. Whatever the action, this must be planned for.
	5. Resourcing	This is critical to the enactment of the aversion strategies. Highest priority enjoying attention first. Along with resource allocation, responsibilities and authorities are assigned.
	6. Controlling	Action is taken to ensure that the goals set earlier are indeed achieved. Communication is a vital component of this activity.
	7. Monitoring	This ties in with control. Risks are tracked against predetermined metrics or performance standards.

There are a host of factors that impact on a risk management process. Some of the most important aspects include:

- Decision processes are not always rational due to individual biases.
- Top down and bottom up approaches to analysis provide different views. The former typically focuses on resource allocation (capitalisation) while the latter on the nature of their utilisation (performance).
- Co-operation and buy-in from all concerned.
- A risk identified, evaluated and a contingency plan developed does not imply that the risk is no longer a reality[2].
- Errors that arise from poor or uninformed estimation of risks.
- Analysis tools must be used with understanding. They can derive precise numbers - but these may be contextually incorrect.
- The selection of the combination of risks based on types, number, severity and combination.
- The environment is constantly changing and hence the total risk profile changes as well.

[1] Bosman describes the prioritisation of the projects where risks are considered using fuzzy set theory [67].

[2] This is an important flawed perception typically induced by much literature. The incessant focus on the analysis components engenders a perception that a risk analysed is a risk managed.

Charette indicates that risk management if not properly practised is extremely dangerous. He provides the following guides to managing the risk management process:

- All organisations have some facets of risk all of the time. All in the organisation need to understand this.
- Concentrate on capabilities that exist, not good intentions.
- Use joint analysis to address a cross-section of risks (bottom-up and top-down approaches).
- Use a recursive approach.
- Use automated tools wisely. Tools can only help determine the answer, not the correct question.
- Call the risk management process, opportunity management. It sounds more positive which keeps it from looking like blame analysis.
- High level of communication.
- Develop a thick skin. Document assumptions and make the process for achieving these transparent.

2.11.3 The practice of managing risk

Charette puts forward that when managers are faced with decision-making, they require answers to the following 7 questions. These are:

- What are the risks involved, and are they higher or lower than in the past?
- Are the risks likely to increase or decrease in the future?
- What is the organisation currently doing to manage these risks?
- What is the schedule and expected results from alternative risk aversion measures?
- How will they know that these measures are being instituted?
- Who is responsible for these measures?
- How will communication of these risks take place internally as well as to the customer?

Companies that best manage risk, do not rely on individual experience. They have mechanisms aimed at providing reliable answers. These organisations possess 5 additional key characteristics, namely:

- They take a disciplined approach to decision-making.
- They hold a different perspective of risk.
- Management communicates a risk taking ethic to the organisation.
- They embrace a systemic view of risk.
- They perform continuous risk management.

In order for an organisation to move to the top of the risk helix [Figure 19], he proposes the following:

- Management of risk (MOR) must be addressed properly or the organisation will likely end up worse off.
- Starting this process involves time, discipline, money, accountability, attention to detail, a sense of timing, a number of false starts and some luck.

- The benefits of MOR must be determined and made transparent.
- Focus on the level of the process that is required and scale all details accordingly, while keeping the process simple.
- Align all procedures with the goal of improving decision-making.
- Use the fundamentals of the "seven questions" as the basis for decision-making.
- Allow time for the risk approach to become entrenched in the culture[1].
- Policies and guidelines around MOR must be established.
- Techniques should be aligned/consolidated where possible with the existing approaches.
- The level of unacceptable risk must be established.
- The MOR approach needs to be integrated with all other management initiatives.

The attitude of proactive organisations at this stage is one of adapting their perceptions and realising that decisions can be changed. Reactive organisations typically believe that decisions are cast in stone.

2.12 Business process redesign

Business process re-engineering (BPR) as it was coined by Hammer in the early 1990's [39] was propelled to the forefront of business improvement techniques. It purported a whole new way of doing business giving the so-called quantum leap that was increasingly sought after in a highly competitive world. A myriad of literature followed [5, 8, 9, 39, 54, 55, 57, 75, 78, 79, 80, 81, 82, 83, 84] and is still emanating from the "buzzword".

In summary, BPR is sold on the basis that an organisation which only continuously improves is actually falling behind in "real terms". These facts are made painfully clear by means of benchmarking, following which, statements are made alluding to the case for a quantum leap as shown in Figure 21[2].

[1] This requires a change in organisation behaviour. The way of addressing this is described later in this thesis.

[2] It is not just the BPR proponents who use this graph to sell their method. The "downsizers" use it as well. In this instance, a business case is made for significant cost-cutting in order to have cash for investment in new competitively focused areas. An example of this is McKinsey's Total Operational Performance (TOP) method. It can be noted that although the approach is cost cutting focused, it does use some process redesign technique where appropriate in the confines of the method.

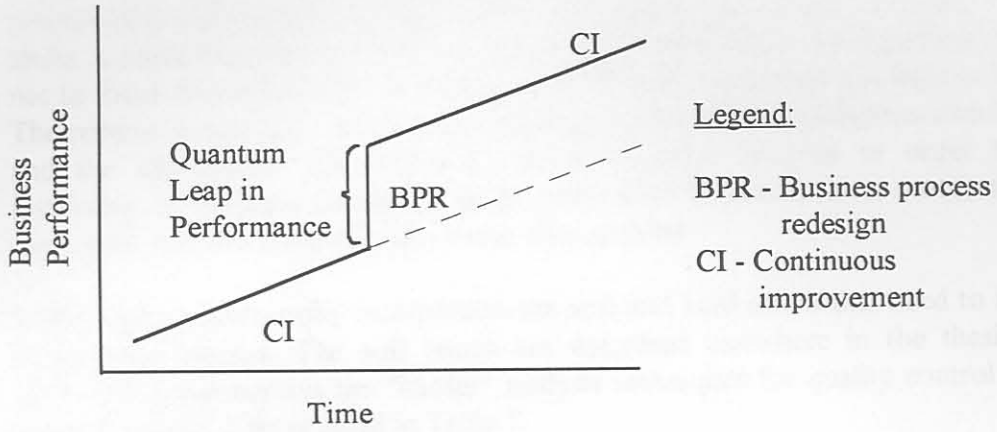


Figure 21 - Incremental versus Radical Business Performance Improvement

The focus of BPR is on getting businesses to focus on their processes and not to organise and behave functionally as in the past. Unfortunately in the process, business writers of the past like Weber, Fayol and Taylor [40] in particular were used as scape goats as they had purported functional and hierarchical thinking.

Much of the impetus for the BPR euphoria was given by the IT practitioners who generally purported that BPR was now possible due to advances in IT. Some industrial engineers may not agree entirely, but whether this is true or not was probably one of the reasons for many early BPR exercises being less than successful. Much hype was going into serious business restructuring by practitioners who were relatively inexperienced in (1) the domain of the business under consideration, (2) the method (BPR) being purported and (3) the necessary business skills and acumen.

In conclusion, BPR has made a significant contribution to economics and theory and will no doubt continue to do so.

2.13 Total quality management

The concept of quality has been moulded into the form of total quality management (TQM) as it is known today. Included in this list of contributions are Deming [68], Feigenbaum [69], Crosby [70], Ishikawa [29], Taguchi [71], Juran [72] and so on. Today, various accents on the concept of TQM exist. A useful definition is however provided by Watson [57, pp52-53]. He believes that TQM is about producing organisational change and creating value. He indicates that it is the combination of the following core components.

- *"A behavioural model for co-operation, which is based on teams functioning in a participative environment.*
- *The use of statistical tools, process analysis and management by fact to provide analysis of process elements.*
- *The focus on the customer as the driver of the business product and service requirements.*
- *The adoption of a closed-loop planning process that is consensus-based and empowering of teams because (a) it provides a participative framework that is based on the use of*

structured data analysis, internal business diagnoses and strategic benchmarking; (b) it negotiates the setting of enterprise objectives with the allocation of resources to achieve personal objectives; (c) it links organisational performance and competence development with individual performance and competence development through a closed-loop performance appraisal and recognition system.

- *The use of project management methods to deploy change initiatives throughout the organisation."*

This definition comes a long way from the early approaches to quality and TQC in the 1960's and 1970's. From this definition it is clear that TQM is a business improvement philosophy which aims at permeating the behaviour of an organisation while supplementing this behaviour with various tools and techniques. It is interesting to note that while the early proponents of BPR have gone to great lengths to clearly differentiate the approaches of BPR and TQM, Watson views

"re-engineering as an extension of project management to direct major strategic change initiatives that have been employed within the context of the robust TQM system."

It is assumed that Watson's viewpoint is that BPR is a technique which resides within the TQM philosophy. What makes the understanding of the relationship "fuzzy" is that practitioners and academics tend to label initiatives and then try to reconcile all and sundry under a particular banner. When addressing problems within an organisation it is important not to focus on a philosophy or technique and then try and relate this back to the organisation. The reverse should hold, namely the strategic needs of the organisation should be understood and the appropriate philosophy(ies) or technique(s) selected in order to facilitate the instituting of business change. It is the generation of wealth on a sustainable basis that is important, not which technique is better than another.

TQM, being a philosophy incorporates the soft and hard issues that need to be conducted for operational success. The soft issues are described elsewhere in the thesis. Bechtell [73, pp321-330] summarises the "harder" analysis techniques for quality control in an "analytical quality toolkit". This is listed in Table 7.

Table 7 - Analytical Quality Control Toolkit

Question	Tool
Where are the data?	Checksheet
With what frequency are our problems occurring?	Histogram
What has happened over time?	Line graph
Is the process in control?	Control chart
Which problems are most prevalent?	Pareto chart
What are the contributing factors?	Ishikawa diagram
Is there a correlation between factors over time?	Scatter diagram
What does the process look like?	Process flow diagram

2.14 Learning

"To practice a discipline is to be a lifelong learner. You never arrive; you spend your life mastering disciplines. You can never say "we are a learning organisation" and more than you can say "I am an enlightened person". The more you learn, the more acutely aware you become of your ignorance. Thus a corporation cannot be excellent in the sense of having arrived at a permanent excellence; it is always in the state of practising the disciplines of learning, or becoming better or worse."

Senge [58, p11]

Learning in literature and practice today is becoming a very important feature in the day to day activities of an organisation. Learning helps the organisation to improve, it allows synergy to take place and it facilitates not making mistakes from experience as well as the cognitive insights that it stimulates. Business today can no longer function in hierarchy mode where management are omnipotent and employees the mindless workers. The potential within the organisation needs to be harnessed from all people and applied in a creative, yet focused manner.

Senge [58], one of the foremost leaders in organisational learning proposes the exploitation of 5 disciplines in order to strive towards becoming the learning organisation. These are:

- **Systems thinking** - Systems thinking, the fifth discipline, is a conceptual framework, a body of knowledge and tools to make the patterns clearer between the interaction of all system components.
- **Personal mastering** - The discipline of continually clarifying and deepening personal vision, of focusing energies, of developing patience and seeing reality objectively.
- **Mental models**[1] - These are deeply ingrained assumptions, generalisations or even pictures or images that influence how we understand the world and how we take action.
- **Building a shared vision** - A genuine vision (as opposed to the all too familiar "vision statement") where people excel and learn, not because they are told to, but because they want to.
- **Team learning** - This is initiated via dialogue, vital because teams, not individuals are the fundamental learning units in an organisation. Without teams, the organisations cannot learn.

He [58, pp373-377] summaries the practices, principles and essences into Table 8.

[1] Compare with Barker's "paradigms".

Table 8 - Practices, Principles and Essences of the Learning Organisation

Discipline	Practices	Principles	Essences
Systems thinking	• System archetypes[1]. • Simulation.	• Structure influences behaviour. • Policy resistance. • Leverage.	• Holism. • Interconnectedness.
Personal mastery	• Clarifying personal vision. • Maintaining creative tension. • Making choices.	• Vision. • Creative vs. emotional tension. • Subconscious.	• Being. • Generativeness. • Connectedness.
Mental models	• Distinguishing data from abstractions based on data. • Testing assumptions. • "Left-hand" column.	• Exposed theory vs. theory in use. • Ladder of influence. • Balanced inquiring and advocacy.	• Love of truth. • Openness.
Building a shared vision	• Visioning process. • Acknowledging current reality	• Shared vision as "hologram". • Commitment vs. compliance.	• Commonality of purpose. • Partnership.
Team learning	• Suspending assumptions. • Acting as colleagues. • Surfacing own defensiveness. • "Practising"	• "Dia logos". • Integrate dialogues and discussion. • Defensive routines.	• Collective intelligence. • Alignment.

Brown et al [90, p217-227] provide the model shown in Table 9 to create a learning organisation.

Table 9 - Creating the Learning Organisation on 3 Fronts

Organisational Strategies	Leadership Strategies	Team Strategies
1. Create learning infrastructures	1. Champion a shared vision	1. Practice the art of dialogue
2. Promote experimentation	2. Manage confusion and tension	2. Develop the habit of reflection
3. Empower employees	3. Model learning	3. Embrace change

[1] System archetypes are generic structures, taken from the system dynamics field, are based on the principle that certain problems of structure recur again and again. The small number of these suggest that not all management problems are unique.

2.15 Qualitative and quantitative methods

There are two general categories of techniques used to assist in identifying, analysing and facilitating decision-making. These are either quantitative or qualitative methods. Quantitative methods deal with situations where data exists either in numerical format or can be translated to numerical format for processing by mathematical means. Qualitative methods on the other hand deal with situations where descriptive means are used on either numeric or non-numeric data.

Risk and uncertainty can be modelled using either qualitative or quantitative means, but in many instances risk is modelled via quantitative means due to the nature of information available and techniques developed. On the other hand uncertainty lends itself to modelling by qualitative means primarily due to the lack of historical information, and techniques such as Delphi provide more meaningful analysis.

The following definitions are used later in the text:

- Stochastic - contains one or more random variables
- Deterministic - contains no random variables
- Continuous - uninterrupted in time or sequence
- Discrete - Discontinuous, individually distinct

- Discrete-time stochastic process is a process where the relationship between random (distribution dependent) variables can be viewed at discrete intervals.
- Continuous-time stochastic process is a process where the random variables can be viewed at any particular point in time, not at fixed intervals.

2.16 Chapter conclusion

This chapter has provided the concepts which are fundamental not only to the analysis phase, but to the study in general. Some concepts were only listed, while others where elaborated on in more detail. The rationale is that some level of knowledge is assumed and therefore only a limited range requires elaboration.