7. Appendices

Appendices

The following appendices are included in this thesis:

Appendix A - Change management approaches
Appendix B - Expected monetary value
Appendix C - Risk analysis worksheets
Appendix D - Markovian theory and application
Appendix E - Application documentation
Appendix F - Steps to developing scenarios
Appendix G - Fastchicks theoretical case study
Appendix H - Competence and an organisation's capability
Appendix I - Covering letter and questionnaire
Appendix J - Detailed descriptive statistics of responses
Appendix K - Question 7 - Contingency table
Appendix L - Question 7 - Correspondence analysis
Appendix M - Question 7 - Transformed data: Descriptive statistics and factor analysis
Appendix N - Products used in risk management practice
Appendix O - Tables for randomised block design on question 7
Appendix P - Software

8. Appendix A - Change management approaches

This list is modified from Schumacher's classification of change management approaches [54]. The summary of the classification is shown in Table 2.

Individual change approaches	Author
Re-engineering Yourself	(Aaroz/Sutton, 1994)
Stewardship	(Block, 1993)
The Seven Habits of Highly Effective People	(Covey, 1989)
The Evolving Self. A Psychology for the Third Millennium	(Csikszentmihalyi, 1993)
How to Stubbornly Refuse to Make Yourself Miserable	(Ellis, 1988)
The Tactics of Change	(Fisch/Weakland/Segal, 1982)
Masterful Coaching	(Hargrove, 1995)
Thriving in Transition	(Perkins-Reed, 1996)

Social psychological change approaches	Author
Knowledge for action	(Argyris, 1995)
Changing the Essence	(Beckhard/Pritchard, 1992)
Leading Self-Directed Work Teams	(Fisher, 1993)
Organisation Development	(French/Bell jr., 1973)
Group's that Work (and those that don't)	(Hackmann, 1990)
Changing Behaviour in Organisations	(Judson, 1991)
Field Theory	(Lewin, 1982)
Change at Work (Action Science Approach)	(Mink/Esterhuysen/Mink/Owen, 1993)
Designing Effective Organisations (Sociotechnically)	(Pasmore, 1988)
Competitive Advantage through People	(Pfeffer, 1994)
Driving Fear out of the Workplace	(Ryan/Oestreich, 1991)

Cultural Change Approaches	Author
Corporate Cultures	(Deal/Kennedy, 1982)
Working the Shadow Side	(Egan, 1994)
Corporate Assessment (A Company's Personality)	(Furnham/Gunter, 1993)
Organisations on the Couch	(Kets de Vries, 1991)
How Leadership Differs from Management	(Kotter, 1990)
Corporate Culture and Performance	(Kotter/Heskett, 1992)
Organisational Behaviour	(Organ/Bateman, 1991)
Organisational Culture and Leadership	(Schein, 1992)
The Re-engineering Alternative	(Schneider, 1994)
Unwritten Rules of the Game	(Scott-Morgan, 1994)

Innovation Approaches	**Author**
Innovationsmanagement	(Hauschildt, 1993)
Polarity Management	(Johnson, 1992)
Diffusion of Innovation	(Rogers, 1983)
Mastering the Dynamics of Innovation	(Utterback, 1994)

Global Change Approaches	**Author**
Turning Points	(Fombrun, 1992)
The Unshackled Organisation	(Goldstein, 1994)
Diagnosis for Organisational Change	(Howard, 1994)
Organisational Change and Redesign	(Huber/Glick, 1993)
The Challenge of Organisational Change	(Kanter/Stein/Jick, 1992)
Corporate Transformations	(Kilman, 1988)
Transforming Organisations	(Kochan/Useem, 1992)
Discontinuous Change	(Nadler/Shaw/Walton, 1995)
Creative Destruction	(Nolan/Croson, 1995)
The Fifth Discipline (Learning Organisation)	(Senge, 1990)
Breakpoints	(Strebel, 1992)
Rethinking the Organisation	(Tomasko, 1993)
Sculpting the Learning Organisation	(Watkins/Marsick, 1993)

Practitioner Approaches to Change	**Author**
Road Map to Corporate Transformation	(Berger/Sikora/Berger, 1994)
Managing the Speed of Change	(Conner, 1995)
Managing Organisational Change	(Connor/Lake, 1994)
Peopleware	(DeMarco/Lister, 1987)
The Limits of Organisational Change	(Kaufmann, 1995)
Changing the Way We change	(LaMarsh, 1995)
Beyond the Wall of Resistance	(Maurer, 1996)
Change Management	(McCalman/Paton, 1992)
Better Change - Best Practices	(Price Waterhouse, 1995)
Taking Charge of Change	(Smith, 1996)
Handbook for Revolutionaries (Jack Welch's Story)	(Tichy/Sherman, 1993)
Reward Systems for Changing the Workplace	(Wilson, 1994)

9. Appendix B - Expected monetary value

This is modified from Moilanen et al [127, pp163-166].

9.1 Risk Assessment

At the time of analysis one cannot measure exact values for all the factors which will affect the investment, e.g. future exchange rates, inflation, production process efficiency etc. However, one can estimate ranges of possible values that each variable may have.

There are various options as to how one may allow for risk in assessing an investment:

a) Sensitivity analysis - this will provide a result for a given change, but it does not consider the likelihood of this change occurring;

b) Descriptive language - "high", "low" risk, "a long shot", etc. This is a purely subjective view, since the definition of risk, and levels, will differ from person to person. The interpretation of this language also differs from person to person;

c) Use higher discounting rate in Discounted Cash Flow (DCF) calculation but this is not appropriate. The discount rate used in evaluating future cash flows should relate to the earnings rate of future invested capital at the <u>company</u> risk level (which is not the risk level of an individual project); the discount factor serves only to tie the value of money at two different points in time together;

d) Quantify the relative likelihood of occurrence of each possible outcome - i.e. risk analysis. One can then weight each outcome's financial value by its likelihood of occurrence, and calculate a "risk-weighted average value" of a project/investment, taking account of all the possible outcomes. This risk-weighted average value is called the Expected Monetary Value (EMV).

In order to derive the EMV one must consider :

- The possible values for the variable parameter in a scenario;
- Their relative likelihood of occurrence (expressed as probabilities summing to one);
- The risk-weighted average value for the parameter derived from this probability series.

The EMV of a range of possible financial values for a parameter is the risk-weighted average of the possible values associated with its probability. To derive the EMV for a total project, one can sum the EMVs of the individual elements within it.

Different scenarios under consideration are not scenarios with differing levels of each parameter but different as to the strategic solution to a problem in a company. Often sensitivity analysis is conducted by varying the expected value of a parameter included in the equation. In EMV scenarios, the scenarios are different in terms of the actual parameters included and the solution they reflect.

Like Net Present Value of a project, EMV or a sum of separate EMVs is not found in company finances later. Both of them depend on the actual outcome of the cash flows and the actual discount rate of the company. These again depend on the operating environment and the financial markets.

9.2 Calculating EMVs

The EMV approach requires the specification of three possible values for each parameter, with their probability given at pre-defined levels:

- the MOST LIKELY value;
- the value which there is a 90% probability of exceeding as the LOWER value;
- the value which there is only a 10% probability of exceeding as the UPPER value.

With these three values it is possible to calculate a factor by which to move the MOST LIKELY value to the RISK- WEIGHTED AVERAGE (mean) value - i.e. the EMV for financial values. This is shown in Figure 60.

The area of the triangle L, VL, PI is 0.1 (if the question is framed to give the "90% probability" value), as is the area of the triangle U, VU, P3. The area of the triangle L, P2, U is equal to 1, since this is the sum of all the probabilities.

We can make five statements about Figure 60:

$$(VL - L)/2 * P1 = 0.1$$

$$(U - VU)/2 * P3 = 0.1$$

$$(U - L)/2 * P2 = 1$$

$$P2/P1 = (VM - L) / (VL - L)$$

$$P2/P3 = (U - VM) / (U - VU)$$

where we know values for VL, VM, VU.

We need to solve these equations to give us values for P1, P2, P3, L and U. With the actual parameters of the triangle known, we can then calculate where the "centre of gravity" is; this is the weighted average point in the probability distribution, and its position on the value axis represents the EMV of the values given for the parameter under inspection. These calculations can be done in a PC spreadsheet application.

9.3 Steps in determining EMVs for project parameters

The following practical steps can be followed when compiling the relevant EMVs of the various parameters in the overall investment evaluation.

1. Determine the parameter.

In most cases this is clear. Sometimes a surrogate measure is needed.

2. Estimate the annual cash flows for each year within the time scale.

The cash flow of a certain parameter may vary from year to year, e.g. the amount needed to invest in capital assets. Calculate the gross cash flow for each year for the parameter. This is easiest done in a spreadsheet where every parameter is listed in the first column. The following columns represent each year in the calculation. In the matrix that is thus formed you need to fill in the relevant gross cash flow.

3. Determine the risk factor for each parameter.

In this stage you need to ask yourself or the person with the best knowledge of the risk profile of the parameter in question the questions outlined in the previous section. Do ask these question exactly as given. Otherwise you may state the questions wrongly and get a wrong answer for your risk factor.

4. Multiply each parameter value in each year with the risk factor.

This is again easiest done in a spreadsheet where you already have the non-risk weighted values of each parameter.

5. Calculate the net risk-weighted cash flow for each year.

6. Discount the net risk-weighted cash flows of each year to the base year using the company discount rate.

10. Appendix C - Risk analysis worksheets

RISK ANALYSIS SUMMARY SHEET

PROJECT: XXX

BASELINE EXPOSURE

	Total	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
Baseline Risk Exposure	**63.24**	6.32	6.32	6.32	6.32	6.32	6.32	6.32	6.32	6.32	6.32
Target Improvements (%)											
Target Exposure	**63.24**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**
Target Cost of Risk Improvement	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Baseline Risk Index **0.00**

Total Number of Risks	11

Q2		Q1
4		3
1		3
Q4		Q3

Top 10 risks (By Cost Exposure)
#1 Risk B
#2 Risk G
#3 Risk C
#4 Risk I
#5 Risk E
#6 Risk K
#7 Risk F
#8 Risk J
#9 Risk H
#10 Risk A

OPTIMISED EXPOSURE

	Total	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
Baseline Risk Exposure	**63.24**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**
New Risk Exposure	**43.52**	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35
Cost of Risk Interventions	**9.70**	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Net Expected Financial Cost	**53.22**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**
Actual Cost of Risk Improvement	**10.02**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Variance: Actual - Target	**10.02**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

New Risk Index **0.00**

Total Number of Risks*	**11**

* In new portfolio

Q2			Q1
	4	3	
	1	3	
Q4			Q3

New Top 10 risks (By Cost Exposure)
#1 Risk B
#2 Risk G
#3 Risk C
#4 Risk I
#5 Risk E
#6 Risk K
#7 Risk F
#8 Risk J
#9 Risk H
#10 Risk A

Top 10 Risk Interventions (By Financial Importance)
#1 Action 2
#2 Action 9
#3 Action 8
#4 Action 11
#5 Action 3
#6 #N/A
#7 #N/A
#8 Action 6
#9 #N/A
#10 Action 1

Risk ID#:		**Name:**						**Category:**						
Significance:	H	M	L	**Likelihood:**	H	M	L	**Method:**	P()	Rating	EMV			
EMV:	H	M	L	**Rating:**	1	2	3	4	5	6	7	8	9	10
				Probability:		**Threshold:**								
Consequence:		**Source/reference:**												
Description/attributes:														

Risk ID#:		**Name:**						**Category:**						
Significance:	H	M	L	**Likelihood:**	H	M	L	**Method:**	P()	Rating	EMV			
EMV:	H	M	L	**Rating:**	1	2	3	4	5	6	7	8	9	10
				Probability:		**Threshold:**								
Consequence:		**Source/reference:**												
Description/attributes:														

Risk ID#:		**Name:**						**Category:**						
Significance:	H	M	L	**Likelihood:**	H	M	L	**Method:**	P()	Rating	EMV			
EMV:	H	M	L	**Rating:**	1	2	3	4	5	6	7	8	9	10
				Probability:		**Threshold:**								
Consequence:		**Source/reference:**												
Description/attributes:														

RISK ESTIMATION WORKSHEET

RISK ESTIMATION SCORECARD																							
Category ID number	**Category**	**Risk ID number**	**Baseline Ranking**	**Baseline Risk**	**Significance**	**Likelihood**	**Portfolio**	**Threshold**	**Baseline Consequence**	**Baseline Probability**	**Baseline Expected cost**	**Weight**	**Baseline Score**	**Period 1**	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**	**Period 7**	**Period 8**	**Period 9**	**Period 10**
TOTALS				**11**							**63.24**		**0.00**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**	**6.32**
C1	Strategic	P1.1	10	Risk A	H	L	Q2		3.2	0.05	0.16			0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
		P1.2	1	Risk B	H	L	Q2		85.2	0.20	17.04			1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
		P1.3	3	Risk C	H	H	Q1		17.3	0.60	10.38			1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
		P1.4	11	Risk D	L	L	Q4		2.0	0.05	0.10			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
		P1.5	5	Risk E	H	L	Q2		16.0	0.40	6.40			0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
		P1.6	7	Risk F	L	H	Q3		2.0	0.80	1.60			0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
		P1.7	2	Risk G	H	H	Q1		29.8	0.50	14.90			1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
		P1.8	9	Risk H	M	L	Q3		9.0	0.05	0.45			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		P1.9	4	Risk I	H	H	Q1		11.8	0.80	9.44			0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
		P1.10	8	Risk J	M	L	Q3		4.1	0.20	0.82			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		P1.11	6	Risk K	H	L	Q2		13.0	0.15	1.95			0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

RISK EVALUATION WORKSHEET

RISK ESTIMATION SCORECARD

Category ID number	Category	Risk ID number	Baseline Risk Ranking	Baseline Risk	Significance	Likelihood	Portfolio	Threshold	Baseline Consequence	Baseline Probability	Baseline Expected cost	Weight	Baseline Score	Intervention ID	Intervention Ranking	Intervention	Responsible	Date	Management Cost	New Consequence	New Probability	New Expected cost	Cost Variance	Financial importance	Net expected financial cost	Weight
TOTALS				11							**63.24**		**0.00**						**9.70**			**43.52**	**19.72**		**53.22**	
C1	Strategic	P1.1	10	Risk A	H	L	Q2		3.2	0.05	0.16			I1	10	Action 1	Resource 1	15/03/98	0.1	0.2	0.05	0.01	0.15	0.25	0.11	
		P1.2	1	Risk B	H	L	Q2		85.2	0.20	17.04			I2	1	Action 2	Resource 2	16/03/98	0.4	30.0	0.20	6.00	11.04	11.44	6.40	
			3	Risk C	H	H	Q1		17.3	0.60	10.38			I3	5	Action 3	Resource 3	17/03/98	1	17.3	0.60	10.38	0.00	1.00	11.38	
			11	Risk D	L	L	Q4		2.0	0.05	0.10			I4	11	Action 4	Resource 4	18/03/98	0.2	2.0	0.05	0.10	0.00	0.20	0.30	
			5	Risk E	H	L	Q2		16.0	0.40	6.40			I5	5	Action 5	Resource 5	19/03/98	1	16.0	0.40	6.40	0.00	1.00	7.40	
			7	Risk F	L	H	Q3		2.0	0.80	1.60			I6	8	Action 6	Resource 6	20/03/98	0.1	2.0	0.40	0.80	0.80	0.90	0.90	
			2	Risk G	H	H	Q1		29.8	0.50	14.90			I7	8	Action 7	Resource 7	21/03/98	0.9	29.8	0.50	14.90	0.00	0.90	15.80	
			9	Risk H	M	L	Q3		9.0	0.05	0.45			I8	3	Action 8	Resource 8	22/03/98	2	9.0	0.05	0.45	0.00	2.00	2.45	
			4	Risk I	H	H	Q1		11.8	0.80	9.44			I9	2	Action 9	Resource 9	23/03/98	2	11.8	0.20	2.36	7.08	9.08	4.36	
			8	Risk J	M	L	Q3		4.1	0.20	0.82			I10	5	Action 10	Resource 10	24/03/98	1	4.1	0.20	0.82	0.00	1.00	1.82	
			6	Risk K	H	L	Q2		13.0	0.15	1.95			I11	4	Action 11	Resource 11	25/03/98	1	13.0	0.10	1.30	0.65	1.65	2.30	

RISK EVALUATION WORKSHEET

					NEW EXPECTED RISK EXPOSURE PER PERIOD										COST OF MANAGEMENT INTERVENTIONS PER PERIOD									
Intervention ID	Intervention Ranking	Intervention	New Score	Score variance	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
			0.00		**4.35**	**4.35**	**4.35**	**4.35**	**4.35**	**4.35**	**4.35**	**4.35**	**4.35**	**4.35**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**
I1	10	Action 1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
I2	1	Action 2			0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I3	5	Action 3			1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
I4	11	Action 4			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
I5	5	Action 5			0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
I6	8	Action 6			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
I7	8	Action 7			1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
I8	3	Action 8			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
I9	2	Action 9			0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
I10	5	Action 10			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
I11	4	Action 11			0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

11. Appendix D - Markovian theory and application

Markovian theory and application is presented by means of an unpublished article included in this appendix for the purpose of illustration.

MARKOVIAN MODELLING IN BUSINESS RISK ANALYSIS

11.1 Introduction

Risk analysis in a business context is largely intangible, allowing limited opportunity for the development of handles - a means by which the risk can be more securely assured, and in the long run, appropriately managed. This text proposes that by means of Markovian analysis a basis can be established for the development of appropriate models. From the analysis, differential equations are established to solve into meaningful formulae for the system and solved via numerical methods. The use and development of this approach is further illustrated by means of example.

11.2 Project risk

Understanding risk inherent in a project[1] is important to the investor as well as the other stakeholders. The investor must thoroughly understand the project's flexibility, while on the other hand the other stakeholders as early as the contemplation stage must make provision for contingencies in order that they do not find themselves in a compromised position due to an oversight on their part. The assumption of the reasonable person is made where the path chosen, is the one not necessarily the most frugal, but the most reliable. Reliability impacts on cost-effectiveness albeit indirectly.

Risk pertains to the chance that an outcome may not prove to be as planned. This definition implies that risk revolves around the concept "planned", all be the occurrence either predominantly unfavourable or coincidentally favourable. This concept of residing in an unplanned state or transferring to another state (or corrective state) is the precept upon which model development presented in this text is based. Markovian analysis is well suited to this type of problem.

11.3 Markovian analysis

The state of a project and its components can be likened to an engineering system. A system's components can each fail at a specific rate (λ_i) or be repaired at a specific rate (μ_i). Depending on the combination of the state of failure and the state of repair of the various components, the system will acquire a profile. This profile will have costs coupled to it as well as decisions regarding re-emergence to the base state of

[1] A business change initiative of significant stature is typically undertaken in project form.

satisfactory repair. Consider the following example. A system comprises of two components providing three states, namely:

- Both components functioning correctly (state S_0).
- One component in a state of failure (state S_1).
- Both components in a state of failure (state $S_{.2}$)

If both components are repairable, the situation may be modelled as shown in Figure 95:

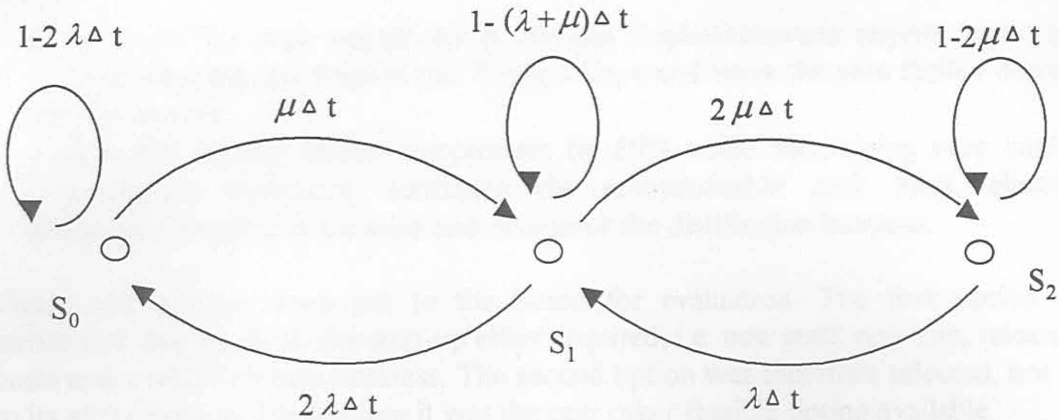


Figure 93 - Simple 3 State Repairable System

The differential equations for the diagram (Figure 95) are:

$$\frac{\delta P_{s_0}(t)}{\delta t} = -2\lambda P_{s_0}(t) + \mu P_{s_1}(t)$$

$$\frac{\delta P_{s_1}(t)}{\delta t} = 2\lambda P_{s_0}(t) - (\mu + \lambda) P_{s_1}(t) + 2\mu P_{s_1}(t)$$

$$\frac{\delta P_{s_2}(t)}{\delta t} = \lambda P_{s_1}(t) - 2\mu P_{s_2}(t)$$

By means of Laplace transforms (or other appropriate means) $P_{s_0}(t)$, $P_{s_1}(t)$ and $P_{s_2}(t)$ can be solved. The reliability of the system is:

$$R_s(t) = P_{s_0}(t) \quad \text{for a series system, and}$$

$$R_p(t) = P_{s_0}(t) + P_{s_1}(t) + P_{s_2}(t) \quad \text{for a parallel system}$$

$R_{s/p}(t)$ implies the expected reliability of the system at a specific point in time taking into account the distribution governing the hazard or repair rate of the various components. In project terms, the hazard rate addresses the probability of a project task falling into an undesirable state, while the repair rate performs the actions (and naturally the cost incurred) taken to place the project into a position where it can be successfully continued.

11.4 Application

11.4.1 Case background

Consider a South African based textile business producing yarn and socks[1]. With the previous dispensation, it was reasonably lucrative to establish a labour intensive business in one of the homelands like Bophuthatswana. The reason for this was the incentives that the administrations put forward to encourage economic development and employment. This form of aid was further assisted by the banning of union activity, even in the light of minimal wages and poor related measures of remuneration.

The breaking up of the previous regions and the reunification of the country has resulted in the elimination of these business "privileges". The business is now subject to a uniform labour law with higher minimal wage and remuneration levels. This can indeed now be enforced by either law or legalised collective labour action.

The textile industry in South Africa is under strain, facing competitive pressures particularly from the so-called Asian tigers. They are able to produce at huge volumes with cost structures lower than locally available. For example the Asian labour cost is generally lower than the local total cost attributable to labour.

The company has already been struggling to maintain market share, but with the two new business drivers, i.e. the higher labour cost pressures and the increased Asian competition, it faces no alternative but to make a fundamental change to the way that business is done. The company brought in a business consultancy who assessed the current operations in addition to the alternatives available. Two clear options emerged, namely:

- Close down the sock operations in the old Bophuthatswana region, open up a material weaving operation in the Western Cape and move the yarn facility down to this site as well.
- Reduce the current labour complement by 60% while maintaining near minimal remuneration structures, terminate the non-profitable sock lines, eliminate preferential internal stock sales and outsource the distribution business.

These two options were put to the board for evaluation. The first option was terminated due mainly to the start-up effort required, i.e. new staff, new site, relocation costs and a relatively new business. The second option was therefore selected, not due to its attractiveness, but because it was the only other feasible option available.

Management involved labour where the future was laid out. The deal was that if they received a particular target of improvement (35%) on a sustainable basis, then after

[1] While this application is based on realistic events, individuals and organisations, it in no way refers to any particular individual or organisation.

two years, it would be possible, not only to improve the remuneration base, but also pay out meaningful bonuses. Negotiations with the shop stewards was very difficult for two reasons, namely (1) management still had a bias for the pre-unionised paradigm and (2) labour was immature in union business politics. Nevertheless, the targets were set amidst a feeling from labour that they were on the wrong end of a win-lose situation.

11.4.2 Application modelling

Input for the following mathematical modelling is from Claasen [146] and Billinton, et al [133].

In order to analyse the dynamics of the possible business states at the macro level, Markovian models were employed. The state diagram is shown in Figure 94.

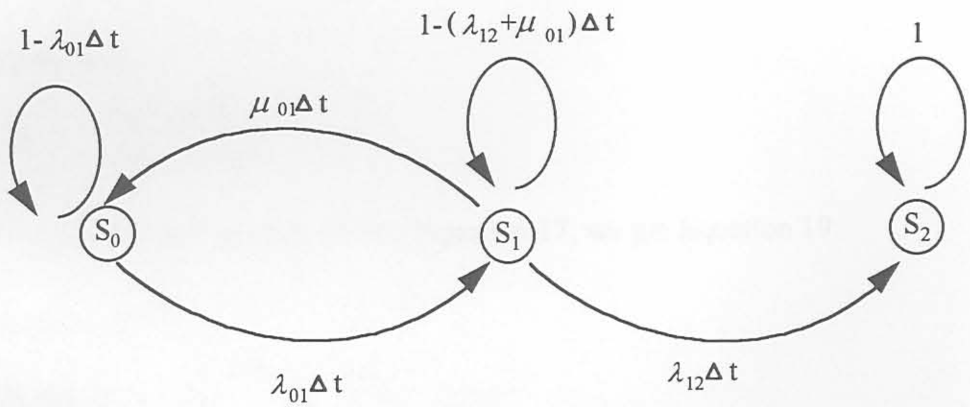


Figure 94 - Textile Business State Change Diagram

From Figure 94:

- State S_0 refers to the starting state of the business before any change takes place.
- State S_1 refers to the state of the company in the event of major labour problems, strikes etc. which will cause significant damage to the business.
- State S_2 refers to the business being liquidated due to irreparable damage from the labour problems. This is an absorbing state as indicated.
- μ_{01} refers to the "repair rate" between states S_0 and S_1.
- λ_{01} refers to the "hazard rate" between states S_0 and S_1.
- λ_{12} refers to the "hazard rate" between states S_1 and S_2.

The following equations follow:

Equation 13

$$\frac{\delta P_{s_0}(t)}{\delta t} = -\lambda_{01} P_{s_0}(t) + \mu_{01} P_{s_1}(t)$$

Equation 14

$$\frac{\delta P_{s_1}(t)}{\delta t} = \lambda_{01} P_{s_0}(t) - (\mu_{01} + \lambda_{12}) P_{s_1}(t)$$

Equation 15

$$\frac{\delta P_{s_2}(t)}{\delta t} = \lambda_{12} P_{s_1}(t)$$

This can be solved by means of Laplace transformations, where Equation 13 is rewritten as Equation 16:

Equation 16

$$sP_{S_0}(s) - P_{S_0}(0) = -\lambda_{01} P_{S_0}(s) + \mu_{01} P_{S_1}(s)$$

As the business change starts at state S_0, $P_{S0}(0) = 1$, $P_{S1}(0) = 0$ and therefore:

Equation 17

$$P_{S_0} = \frac{1 + \mu_{01} P_{S_1}(s)}{s + \lambda_{01}}$$

Similarly,

Equation 18

$$P_{S_1} = \frac{\lambda_{01} P_{S0}(s)}{s + (\mu_{01} + \lambda_{12})}$$

By substituting Equation 18 into Equation 17, we get Equation 19:

Equation 19

$$P_{S_0}(s) = \frac{s + \mu_{01} + \lambda_{12}}{s^2 + s(\mu_{01} + \lambda_{12} + \lambda_{01}) + \lambda_{01}\lambda_{12}}$$

If we let the roots of the equation be x and y respectively, we get:

Equation 20

$$P_{S_0}(s) = \frac{s+\mu_{01}+\lambda_{12}}{(s-x)-(s-y)} = \frac{A}{s-x}+\frac{B}{s-y}$$

By substitution we solve for A and B respectively as shown in Equation 21 and Equation 22:

Equation 21

$$B = \frac{y+\mu_{01}+\lambda_{12}}{y-x}$$

Equation 22

$$A = \frac{x+\mu_{01}+\lambda_{12}}{x-y}$$

Applying the inverse Laplace transform:

Equation 23

$$P_{S_0}(t) = Ae^{xt} + Be^{yt}$$

Solving for x and y results from Equation 24 and Equation 25:

Equation 24

$$s^2 + s(\mu_{01}+\lambda_{12}+\lambda_{01}) + (\lambda_{01}\lambda_{12}) = 0$$

Equation 25

$$s = \frac{-(\mu_{01}+\lambda_{12}+\lambda_{01}) \pm \sqrt{\mu_{01}{}^2 + 2\mu_{01}\lambda_{12} + 2\mu_{01}\lambda_{01} - 2\lambda_{01}\lambda_{12} + \lambda_{01}{}^2 + \lambda_{12}{}^2}}{2}$$

It is now possible to derive the value of $P_{S0}(t)$ for various values of t, hazard rates and repair rates. Analysing the sensitivity of the hazard and repair rates provides insight into those types of risk management actions that can be put into place as illustrated in Table 67 and Figure 95.

Table 67 – Scenarios Using Various Repair and Hazard Rates

	$P_{S0}(1)$	$P_{S0}(2)$	$P_{S0}(3)$
λ_{01}	0.05	0.025	0.05
λ_{12}	0.05	0.05	0.05
μ_{01}	0.5	0.5	0.75
Ps(1 day[1])	0.96	0.98	0.97
Ps(1 week)	0.90	0.95	0.93
Ps(1 month)	0.81	0.90	0.86
Ps(6 months)	0.43	0.65	0.56
Ps(1 year)	0.20	0.43	0.32
Ps(2 years)	0.04	0.20	0.11
Ps(3 years)	0.01	0.09	0.04
Ps(5 years)	0.00	0.02	0.00
Ps(10 years)	0.00	0.00	0.00

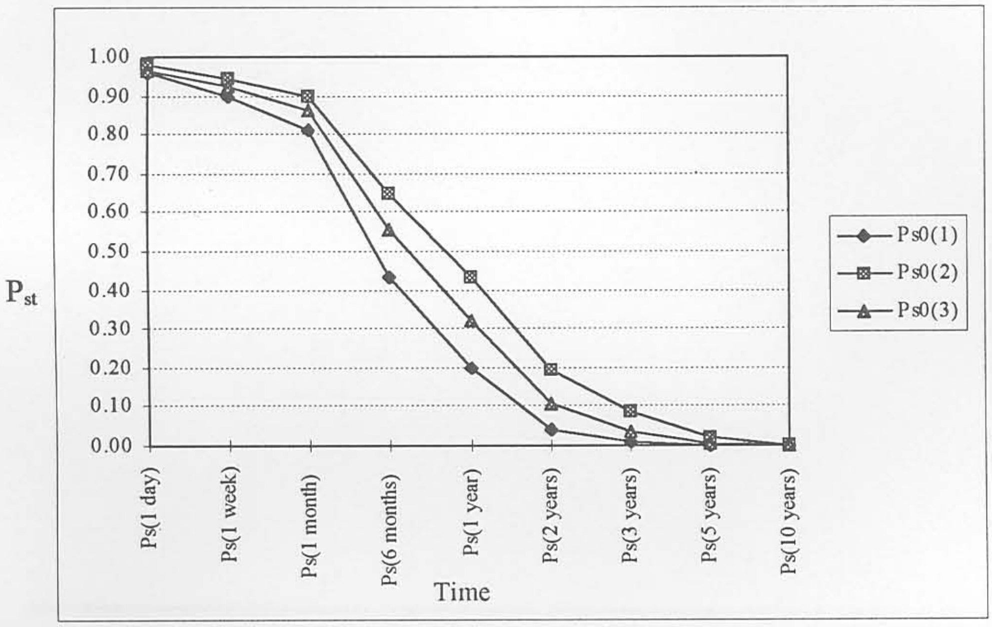


Figure 95 - Scenarios Using Various Repair and Hazard Rates

From Table 67, $\mathbf{P_{S0}(1)}$ refers to a situation where the two "hazard rates" are equal and the "repair rate" is 0.5. This is also used as the control values in the sensitivity analysis. In order to determine the requirements of risk management, both the "hazard rate" (λ_{01}) [$\mathbf{P_{S0}(2)}$] and the "repair rate" (μ_{01}) [$\mathbf{P_{S0}(3)}$]is improved by 50% (or the values of 0.025 and 0.25). From Figure 95, it is clear that more leverage can be gained from addressing the "hazard rate", than by addressing the "repair rate". This would imply that appropriate pro-active risk management would be a better strategy for lengthening the life of a business intervention solution.

[1] 1 day = 1 time unit.

11.5 Conclusion

Markovian modelling provides useful means for the analysis of business related risks. It not only provides the ability to understand the probabilities attributable to the risks of various business states, but also gives insight into their progression over time. The disadvantage however is the mathematical computational effort required which increases directly in relation with the system complexity under consideration.

12. Appendix E - Application documentation

RISK	POSSIBLE	CRITICAL.	THRESH.	FREQ. (F)	CONSEQ. (C)	PROB. (P)	WEIGHT (W)	SCORE (S)	COST (R)
RISK CATEGORY RISK A RISK B RISK C	Y/N?					0-10	0-100 0-100		
RISK EXPOSURE								X	Y

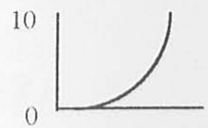
CRITICALITY:
- CRITICAL
- STRATEGIC
- FULL ABSORPTION
- PARTIAL ABSORPTION
- LOW IMPACT

THRESHOLD:
- VALUE
- QUALITY

PER YEAR

RAND (ZAR)

PROBABILITY: FUNCTION



SCORE: S = W x P

BUSINESS EXPOSURE: X = SUM(Si)

EXPECTED COST: R = F x C

FINANCIAL EXPOSURE: Y = SUM(Si)

RECOMMENDED MANAGEMENT ACTION

TIMING OF MANAGEMENT ACTION

NEW FINANCIAL CONSEQUENCE

SAME WEIGHT

NEW COST

RISK	ACTION	RESPON.	DATE	MGT COST (m)	BENEFIT	CONSEQ.	PROB.	WEIGHT	SCORE	COST
RISK CATEGORY RISK A RISK B RISK C										
RISK EXPOSURE				(M)						

RESPONSIBLE PERSON

INCREMENTAL COST OF MANAGEMENT ACTION

TOTAL COST OF MANAGEMENT ACTION

BENEFIT - E.G. REDUCTION IN RISK CONSEQUENCE

NEW PROBABILITY

NEW SCORE

NEW EXPOSURES

13. Appendix F - Steps to developing scenarios

The following steps are recommended to derive scenarios (Schwartz [135, pp241-248]):

- Identify the focal issue or decision.
- Determine the key forces in the local environment.
- Determine the drivers in the macro-environment that impact on the forces identified in the preceding step.
- Rank the forces and the drivers according to uncertainty and importance.
- Select the scenario logics based on the axes of the preceding step.
- Flesh out the scenarios.
- Evaluate the decision (identified during step 1) using each of the scenarios as basis.
- Select leading indicators and signposts in order to identify the unfolding of the future against the individual scenarios.

The following should also be considered when deriving scenarios:

- Do not pre-empt to the obvious three scenarios (high, middle and low road).
- Do not assign probabilities to the various scenarios.
- Provide the scenarios with useful names.
- The scenario development team should be carefully selected.
- Scenario development should be intensely participatory.

14. Appendix G - Fastchicks theoretical case study

Fastchicks Limited is a chicken processor. Its end product includes whole chickens (fresh and frozen), and chicken parts (fresh or frozen). The company consists of the following entities, namely the farms, the processing plants a packaging material company and a pension fund. This relationship is shown in Figure 96.

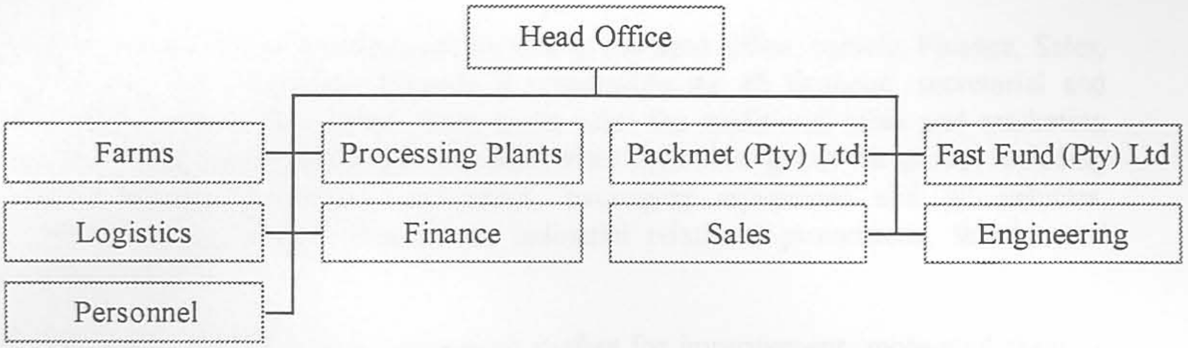


Figure 96 - Entities of Fastchicks Limited

There are three farms growing the chickens for the processing plants. The farms are all situated within a 150 km radius of the two processing plants. Plant A is 30 years old and has been maintained on a fix when broken approach to date. The technology is ageing along with the equipment. Plant B is only 10 years old and is situated 8 km away from plant A. Both plants produce the same products with the same inputs. While plant A uses ageing technology, it tends to operate below capacity approximately 40% of the time. It is however labour intensive when compared to plant B. Plant B having newer equipment is more automated, but has a capacity limitation in the ratio of 2.3:1 in relation to Plant A. The chicken processing process is shown in Figure 6.

The three farms were cloned 30 years ago, each operating under similar profit conditions today. Farm C has however been producing results consistently better than the other farms, which has generally been attributed to the dynamic management of that particular farm. The head office is situated just outside the nearest city, originally for marketing purposes. The geography of Fastchicks is shown in Figure 97.

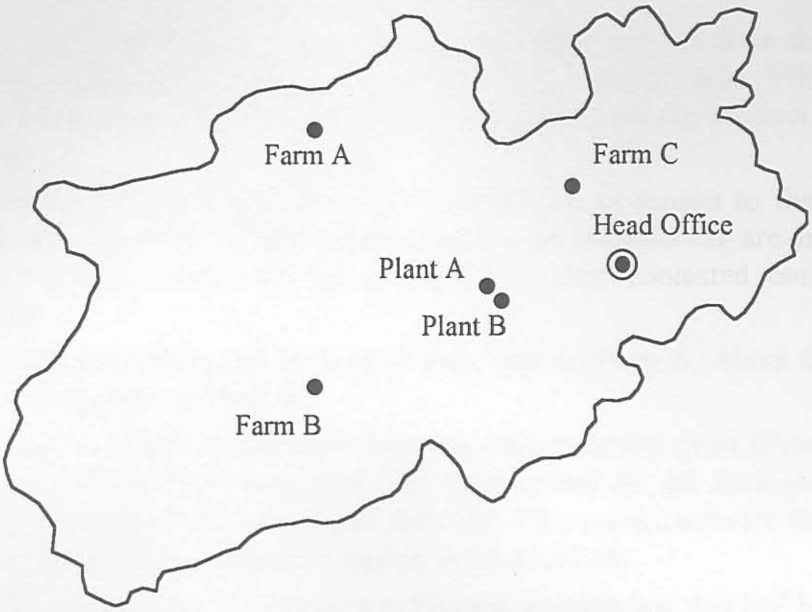


Figure 97 - Geographical Distribution of Fastchicks

Fifteen years previously, a study was done which alluded to the cost-effectiveness of Fastchicks owning their own packaging material plant. A wholly owned subsidiary was formed (Packmet (Pty) Ltd) which produces approximately all of Fastchick's packaging needs. At approximately the same time, a pension fund was formed (Fast Fund (Pty) Ltd) which provides for the pension needs of the group. This business has however proved to be quite a lucrative income generator via its various investment forms, from speculation with shares to property development deals. The assets controlled by the pension fund are worth approximately twice that of the rest of the group. Both these subsidiaries are situated in the same building as the head office.

Four other head office functions are located at the head office, namely, Finance, Sales, Engineering and Personnel. Finance is responsible for all financial, secretarial and information technology duties. Sales looks after the traditional sales and marketing functions. Engineering looks after the equipment used throughout the group, including chicken houses, processing equipment, packaging equipment and all vehicles. Personnel takes care of recruitment, industrial relations, promotions, salaries and housing issues.

Traditionally, the group had undertaken studies for improvement, motivated these to the head office, had them approved on their respective budgets and then implemented these accordingly. Due to the extreme competitive pressure both locally, in addition to the dramatic increase in imported birds, the board decided that the traditional series of disjointed actions would not be enough to turn the company around. They commissioned an external consultant to evaluate the situation from a holistic perspective and make recommendations regarding what should be done.

14.1 Consultant's findings

The consultants on a thorough analysis found the following:

- The recent plague of Newcastle disease ravaged the chicken stock to the extent that breeding stock had been slaughtered to prevent the company from disastrous financial performance (i.e. cash flow in lieu of long term investment).
- The farms operate as isolated entities producing as many birds as possible on the basis that the plant will consume all birds available. Various customers however require certain types of birds. If a farm provides the wrong birds, the production line needs to be adjusted accordingly, the customers contacted and arrangements made to consume the available birds, while postponing current schedules.
- Farms A and B seem to be cost intensive, consuming more resources, while yielding fewer chickens than farm C. The additional resources include higher veterinary costs, labour, feed and utilities. Farm C run by a dynamic manager seems to have a more productive culture, but can flare up in labour problems in solidarity with the other farms when problems occur over there.
- All transport is owned by the group. This provides control over the deliveries which are inevitably late and the expedition of the logistics chain. This means the delivery trucks are often in the "hot seat" trying to speed the product to the irate customers.
- Transport have found Engineering to be ineffective as repairs to the processing plant always takes precedence. Sometimes when breakdowns are inspected by Engineering, they cannot do the job and it is then contacted out to a local contractor.
- Engineering currently spend 50% of all their time on Plant A. About 60% of their budget is consumed by Plant A.
- A significant level of tension exists between the processing plant (Processing) and Engineering where Processing feels that Engineering do not have their needs at heart. Engineering on the other hand feels that Processing mistreats the equipment and often call them in to repair "common sense problems".
- Information technology (IT) reports to Finance as years ago this had been the data processing function, used primarily to do the monthly and annual financial number crunching. Many in the production areas feel that IT can provide more than financials and schedules, but Finance has a hands-off approach, justified by "watching costs".
- Five years ago an accounting consulting firm was commissioned to undertake a study that determined the right product mix and number of chickens required to be produced every day. The consultant indicated that the unit cost would be reduced if the machinery could be better utilised in the processing of the birds. The plant managers are required to keep the equipment and staff running all the time, but the overheads continue to provide a barrier, and hence diminishing margins. This case is even worse with equipment breakdowns as this mode of operation cannot afford scheduled maintenance.
- While production seems to be near maximum capacity, inventory levels constantly appear excessive, particularly in areas where product and work in process (WIP) is

undesirable. As the shelf life of the product and WIP is low, slow moving material (WIP or product) must be frozen. This creates 2 problems; (1) the product mix is incorrect, and (2) margins are reduced due to product with lower value.

- There has been a high turnover of staff in the specialist areas, namely IT, Engineering and Transport. This has been more prominent with the more promising staff. Reasons cited include that there is limited scope for promotion as they do not really understand the chicken business and cannot hope to climb the corporate ladder.
- The deregulation of the chicken industry has resulted in new entrants to the market where chickens are being imported at R1.20 per bird (average) cheaper that they can be produced and processed by Fastchicks.
- An evaluation of people in the organisation was undertaken. A benchmark was undertaken against the best producers in the world. This evaluated against the relative productivity of each function is shown as an index. The results are shown in Table 68.

Table 68 - Results of Fastchicks Benchmarking Performance

Function	# of People	Benchmark Rating[1]
Farm A	65	0.34
Farm B	59	0.29
Farm C	31	0.57
Plant A	109	0.24
Plant B	63	0.62
Engineering	5	0.71
Logistics	6	0.48
IT	10	0.42

The consultant found that while the normal labour rate is relatively inexpensive, the cost of engagement and employment[2] makes the intensive use of labour generally unattractive.

- An environmental analysis yielded interesting results. Some of the peer producers had similar maintenance, transport and IT problems. They felt that the value derived from these functions did not justify the overhead they bore. Some independent farms are providing types of birds complementary and desirable to what Fastchicks are trying to achieve.
- In the more successful plants of the world, chicken processors have tended to focus on the principle of adding as much value as possible to the product. This has resulted in higher utility for the consumer and as a result been more of a niche product, out of the reach of the mass producers. Products of this nature include

[1] This rating indicates if > 1, then better than world class, < than 1, then behind world class. This metric provides an indication of the cost-effectiveness and productivity in general.

[2] This cost takes the energy required in union related strikes, stay-aways, non-production, poor quality, pilferage, overtime for catching up lost time, etc. into consideration.

chicken kiev, kebabs, schnitzels, stir fry's, marinated, etc. The limitations have generally been technology and the accompanying equipment. This is however unexplored territory for the processor.

- One of the components of the benchmarking metrics (Table 68) is yield. Calculations were done indicating that improving the yield by 1% would on average result in R1million additional income. It was found that the processing variability, the mean as well as the distribution of the final product were undesirable when compared against the benchmarks. The current situation as opposed to the benchmark is graphically illustrated in Figure 98[1].

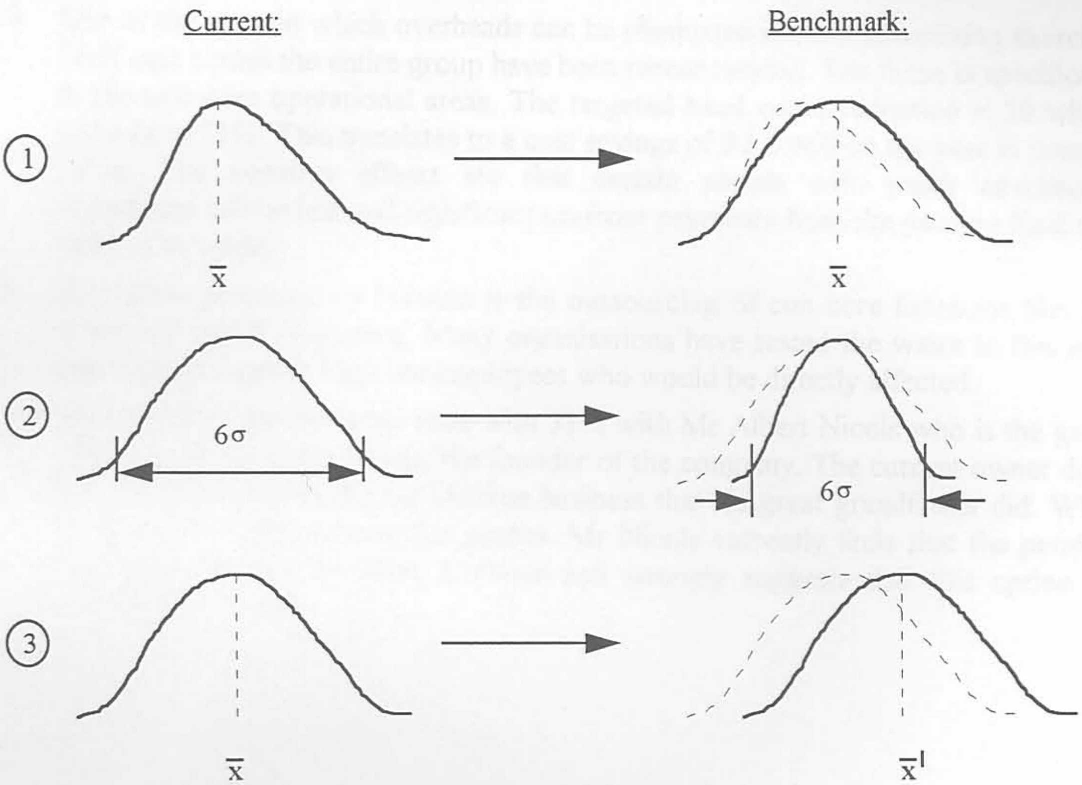


Figure 98 - Current vs. Benchmark Product Quality of Fastchicks

14.2 Alternatives for improvement

Based on various discussions, analyses, calculations, etc., the following opportunities emerged for improvement in the business environment of Fastchicks.:

- One of the most attractive areas for providing the breakthrough required by Fastchicks is via a BPR exercise. One of the plant managers is very keen to do this as it should provide the much needed integration he has been campaigning for in the last 5 years. All levels of the group are however sceptical about the changes and purported benefits that a BPR exercise can bring about.
- Another option for improvement is to embark on a continuous improvement programme, typically via the implementation of a TQM/TPM philosophy. A

[1] This problem is similar for both plants.

rigorous programme of action aimed at improving quality while reducing costs then needs to be carried out.

- The independent farms indicated an interest in exploring a strategic alliance of sorts with Fastchicks. They can provide the types of birds that improve that total bird mix as well as against a schedule very favourable to Fastchicks. There are however risks that the meagre areas of competitive advantage can be lost if not managed properly.
- The option of changing strategic direction into providing value added products seems promising. This will require new technology, equipment and skills. While indicating a possible barrier to entry to competition due to the high cost, complexity and new markets captured, the risk and resulting rewards appear high. Fastchicks does not have theoretical depth or experience in this area. Market research did however indicate a potentially high demand.
- An alternative was developed proposing the automation of slaughtering, evisceration and packaging of the chickens, parts and gizzards. The anticipated benefits include a reduction in labour while resulting in an increase in product yield as well as quality. Problems could however include cost, labour unrest and market loss[1].
- Another option is to increase the processing capacity of plant B. This includes upgrading and replacing some of the equipment. A system that dynamically optimises the plant set-up based on the incoming birds is included. This will accommodate the unreliable delivery of birds from Fastchick's 3 farms.
- One of the ways in which overheads can be eliminated is via a downsizing exercise. Staff cuts across the entire group have been recommended. The focus is specifically in the non-core operational areas. The targeted head count reduction is 50 which equates to 11%. This translates to a cost savings of R1.8 million per year in present value. The negative effects are that certain people with much operational experience will be lost and significant up-front payments from the pension fund will need to be made.
- An option proposed by Finance is the outsourcing of con-core functions like IT, Transport and Engineering. Many organisations have tested the water in this area and there is support from the employees who would be directly affected.
- Ownership of the company rests with 51% with Mr Albert Nicols who is the great grandson of Mr Colin Nicols, the founder of the company. The current owner does not share the passion for the chicken business that his great grandfather did. What he does share is the desire for profits. Mr Nicols currently feels that the pension fund business may be more lucrative and strongly suggests that this option be considered.

[1] A significant proportion of the chicken market is halaal based. This means that their throats need to be slit in order that they bleed for religious purposes. Automation does not currently support this on a cost-effective basis.

15. Appendix H - Competence and an organisation's capability

This appendix is adapted from material made available by Paras Africa.

Organisations today are experiencing increasing pressure to clearly demonstrate value added to all its stakeholders. This value is shown by tangible as well as intangible means. An organisation achieves this by means of processes that collectively aim to satisfy the need of the customer by means of a product or service or a combination of the two. This is typically one way being used to differentiate the provision of solutions.

The processes are however only the structure or a component of the business architecture that enables the delivery mechanism for the product and or service. Certain competencies are required in order to affect the execution of these processes. The relationship between these two facets are therefore analogous to an electronic circuit. The processes provide the structure (physical circuit) while the competencies provide the potential (potential difference) in order for the organisation to perform in its determined form. Together, these along with the resources such as people, technology, capital, etc. (electronic components) are able to achieve a particular goal. Value is attributable by stakeholders to the achievement of this goal as it fulfils their needs and they in turn are enabled to add value in their intersecting systems of endeavour. This relationship between an organisation's strategic processes and its core competencies are shown in Figure 99 [49].

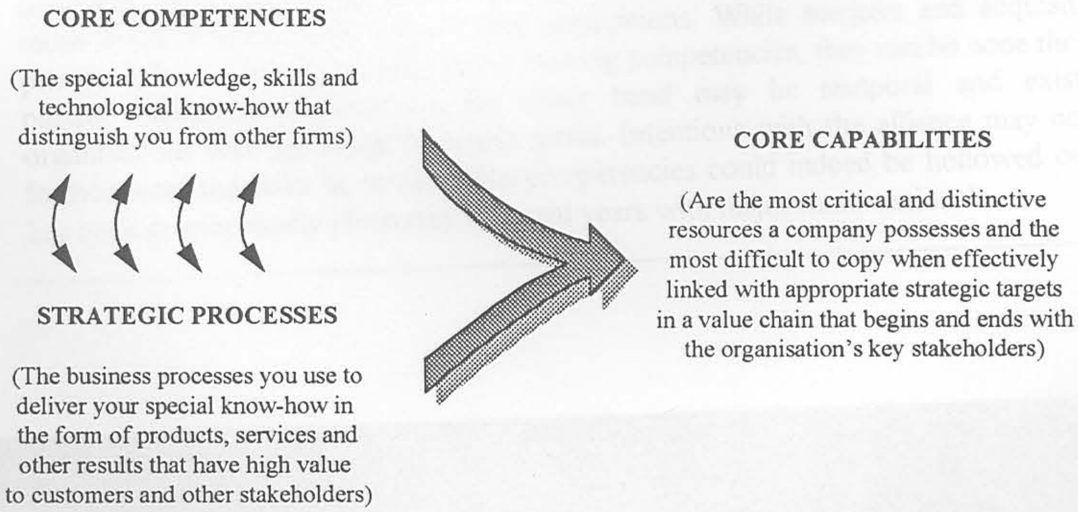


Figure 99 - Relationship between Core Competencies, Strategic Processes and Core Capabilities

The core competencies are the special knowledge, skills and technological know-how that differentiates the organisation from others [6]. It is these core competencies that an organisation requires in order to effect its strategic processes. The strategic processes are the mechanisms the organisation uses to deliver the value by means of the interaction between the skill exploitation and the resources. The core capabilities are the synergistic and intelligent accumulation of the competencies and processes into the distinctive resources required to add value. This forms the organisation's "footprint", very difficult to emulate, but which translates into the organisations value at any particular point in time.

This is where the organisation value is reflected and where its stakeholders evaluate it. It is therefore in understanding this and breaking it up into its components that it is possible to build and leverage value, or indeed fall short of realising this.

This holistic approach forms the basis for understanding an organisation's requirements in order that its actions do not fall short of what it is able to achieve.

From this approach it becomes clear that having the desired competencies cannot be achieved by the establishment of a training programme aimed at acquiring clearly needed skills. If an organisation wishes to mobilise for effectiveness and efficiency on a sustainable basis, it needs to align with the strategic requirements of the organisation - in the short, medium and long term. The organisation therefore needs to understand what these strategic processes are and how they will contribute on a sustainable basis to the organisation's wealth. This wealth is measured in traditional as well as intangible terms like the intellectual capital that forms the fabric of the organisation's value delivery fabric. The basis for understanding and exploiting these strategic processes is necessarily the business strategy. This is translated into the strategic processes, which requires the following dimensions:

- Process structure.
- Responsibility/accountability/authority.
- Process results.
- Performance measures.

It is noted that "process results" and "performance measures" are not necessarily the same, nor are they mutually exclusive. Process results infer the desired outcome from the stakeholders' perspective of the accumulated processes under consideration. Performance measures on the other hand are those metrics reflecting along the length of the various processes that ensure the achievement of the process results. Process results could be likened to the traditional business goals, although goals are not always directed at the achievement of strategic process orientated measures.

As described earlier, these strategic processes are only the structure. They are enabled by means of the core competencies. The competencies are achieved via two approaches, either organically or inorganically. Organic orientated mechanisms include training, education, recruitment and experience. The importance of learning as an organisation therefore becomes pertinent. Inorganic approaches involve the acquisition of competencies and then the focused deployment of these in line with the strategic processes. This may be achieved via the various forms of strategic alliances or the more forceful method of mergers and acquisitions. While mergers and acquisitions provide a limited threat towards losing existing competencies, they can be none the less painful. Strategic alliances on the other hand may be temporal and exist of organisations with generally divergent goals. Intentions with the alliance may not be forthcoming and risks lie in that core competencies could indeed be hollowed out as has been so graphically illustrated in recent years with major multi-nationals.

The relationship between strategic processes and competencies need therefore to be clearly understood particularly in a dynamic environment where decisions have to be taken carefully yet paradoxically need to be quick and decisive. It is worth taking the time to map the requirements of the strategic processes onto the current and future required competencies as shown in Figure 100.

The advantage of this is that gaps are highlighted in terms of the current competence set and what is required of the organisation in the short, medium and long term. It further assists in indicating whether competencies are redundant or soon to be redundant. This helps to link the mobilisation of activities aimed at enriching the competencies with the timeous enactment of the individual strategic processes. It assists in the following instances:

- Does not invest in trying to upgrade competencies where they add no strategic value currently or in the short term.
- Identifies the competencies that are aligned with the business activities where leverage is actually achieved.
- Highlights a path to the attainment of the required competencies.
- Sequences the activities and timing thereof in the attainment of these identified competencies.

The relationship from an organisational perspective of how all these components function in their environment is illustrated in Figure 101.

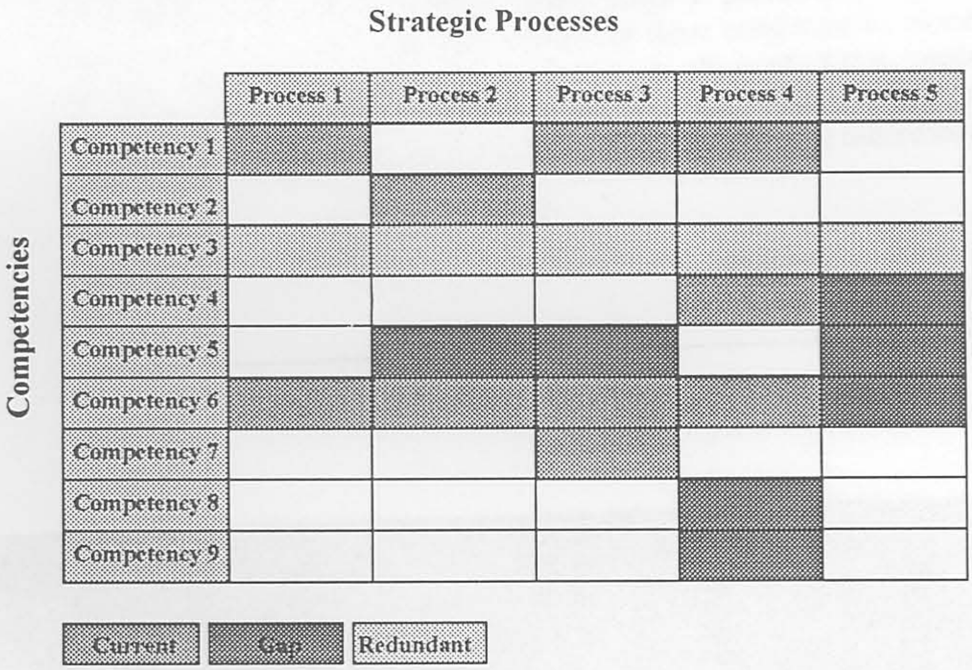


Figure 100 - Competencies / Process Matrix

The environment determines how the organisation is going to function, be this internal or external. An organisation senses (gets feedback) its performance in the market at the operational level as it is this point where it interacts with its world, both internally and externally. It is the reflection on this that results in strategy which in turn can direct the organisation and change its behaviour at the operational level.

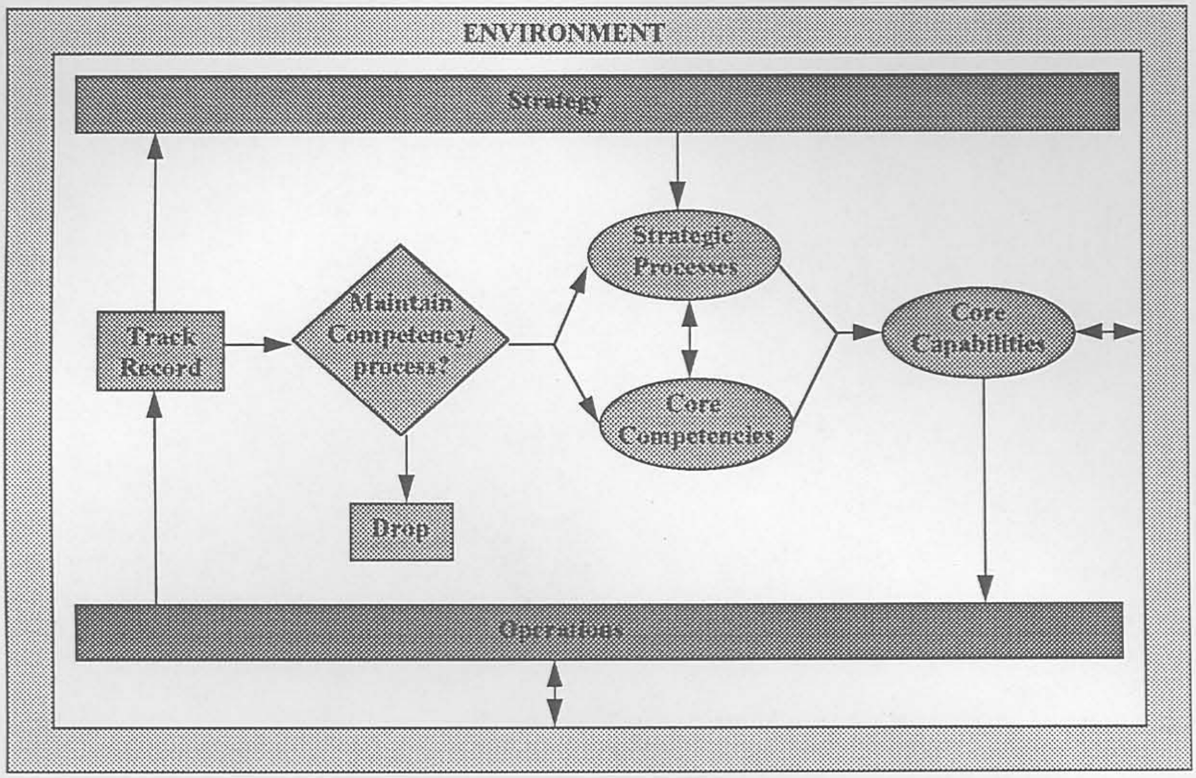


Figure 101 - Organisational Dynamics, Competencies and Processes

This is achieved by means of the derivation of strategic processes which are mechanisms for value accumulation, adding value to all its stakeholders. It is these strategic processes, working complimentary with the right core competencies that determine its core capability. It is this core capability which at the coal face determines the nature and behaviour of the organisation in operations and hence its interaction with the environment. It is also this capability on which an organisation is valued by its environment.

The environment provides feedback to operations in terms of its success or indeed failure in terms of its set out strategic aims. It is this dynamic feedback which assists an organisation in determining whether its strategic processes are achieving their aims or whether they require attention. The same position is true for the competencies. It can be a brutal awakening to realise a particular competence has become redundant and needs no further pursuit. Energy needs therefore to be focused on acquiring and deploying the new competencies and resources.

The management of knowledge assets plays a particularly important role in the acquisition, deployment and maintenance of these competencies especially in the light of the role that technology is playing in all competitive organisations today. Technology is not limited to information technology, rather it is encompassing of the application of knowledge for the betterment of business and indeed mankind.