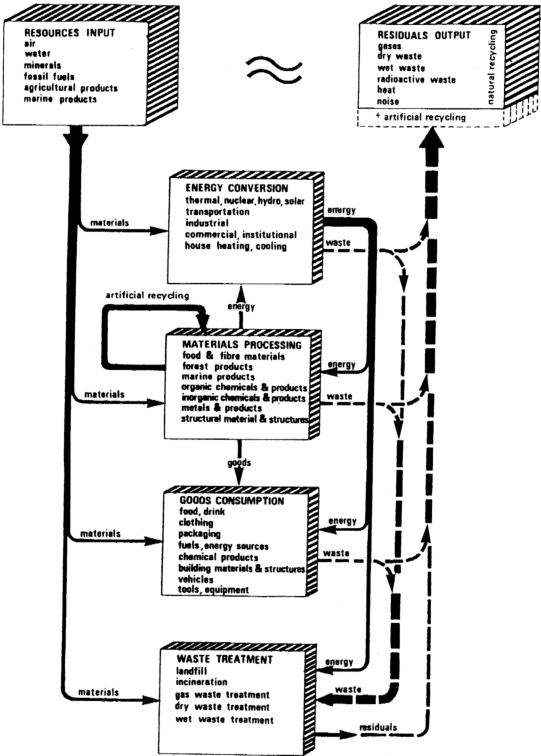
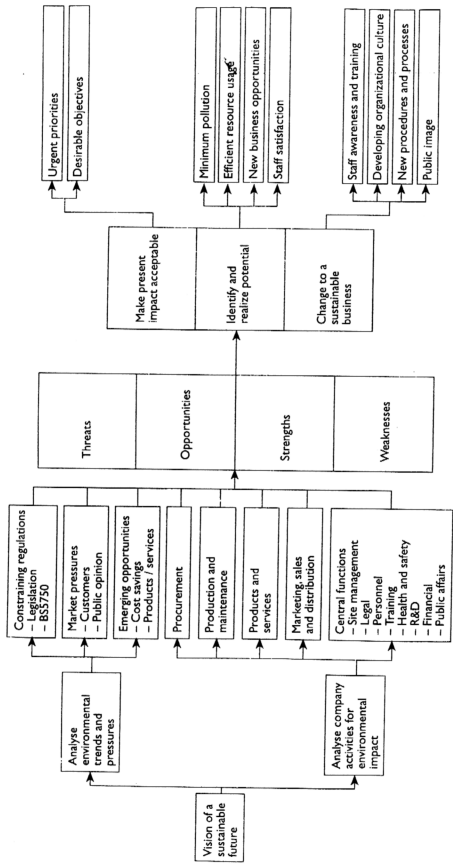


APPENDIX 1



Materials Balance System (Beale, 1980)

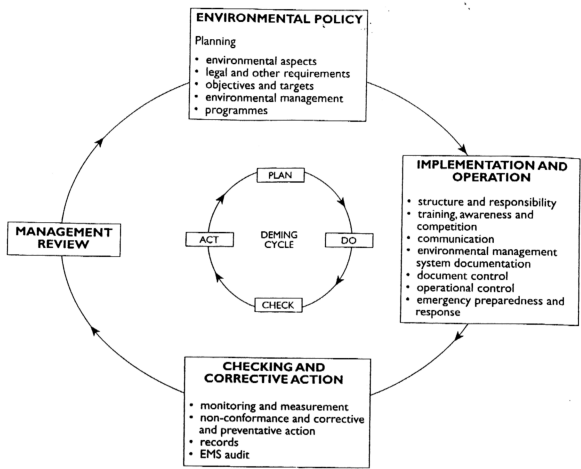
APPENDIX 2



Source: Hutchinson, C (1992) 'Corporate Strategy and the Environment' *Long Range Planning* 25, 4, 9-21

Strategic framework for environmental management

APPENDIX 3



ISO 14001 and the Deming Cycle

Appendix 4

Company : _____
Address : _____

Please tick in the appropriate boxes. Where applicable, you may tick in more than one box.

Our Environmental Management System (EMS)

What is the reason(s) for ISO 14001 certification or implementing an EMS?

- ☐ Moral/corporate responsibility
- ☐ Business strategy to achieve competitive edge
- ☐ Requirement by customers
- ☐ Requirement by stakeholders
- ☐ Remain competitive in global marketplace
- ☐ Influence from parent company
- ☐ Encouragement from the government
- ☐ None of the above but it is a good practice

Others: _____

How do you agree with these statements?

	Strongly Disagree 1	2	Neutral 3	4	Strongly Agree 5
ISO 14001 benefits my company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 14001 certification means good performance of a company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 14001 certification is more prior than ISO 9001/2/3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Third party registration is necessary for successful EMS implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ _____					

During the implementation of EMS/ISO 14001 certification, do you experience the following?

For business control? ☐ Yes ☐ No ☐ Not applicable

In terms of what?
☐ Management
☐ Cost
☐ Process

Others: _____

Transparency/Openness?

☐ Yes

☐ No

☐ Not applicable

es, how?

- ☐ Environmental damaging practices were not hidden but solved
- ☐ Less accusation by others on environmental damaging practices
- ☐ Easier access to info. (not for a commercially sensitive nature)
- ☐ Easier in proving environmental claims
- ☐ Society can "see into" the company and assess what it is doing with its resources that determine future options and react accordingly

Others:

Marketing advantages?

☐ Yes

☐ No

☐ Not applicable

s, in terms of what?

- ☐ Easier entry to global market
- ☐ Increased market share by _____ % (estimate)

Others:

uction in cost?

☐ Yes

☐ No

☐ Not applicable

s, by how much?

_____ % (estimate)

n what area?

- ☐ Waste reduction
- ☐ Increase overall operating efficiency
- ☐ Less energy usage
- ☐ Cost saving through recycling of product inputs
- ☐ Improved quality
- ☐ Less rejects and reworks
- ☐ Materials saving from complete processing/substitution
- ☐ Less downtime through more careful monitoring and maintenance
- ☐ Conversion of waste into commercially valuable forms
- ☐ Reduced packaging cost
- ☐ Savings on insurance cost
- ☐ Less penalties as consequences of complying with the law

Others:

njuries/environmental accidents?

☐ Yes

☐ No

☐ Not applicable

is it

- ☐ among internal staffs, contract workers (within the company)?
- ☐ to the public?

Others:

more research and development?

☐ Yes

☐ No

☐ Not applicable

yes, in terms of what?

☐ Scientific research with respect to ecological issues (for example, on renewal resources)

☐ Ecological research (for example, uncovering ways to reduce the impact of packaging waste)

☐ More liaison with retailers to reduce impact on the environment

☐ Applying pressure on suppliers to use environmentally friendlier manufacturing processes

☐ Applying pressure on suppliers to change packaging

Others:

improvement in operations efficiency?

☐ Yes

☐ No

☐ Not applicable

yes, by how much?

_____% (estimate)

and how?

☐ Increase in process yields

☐ Less downtime through careful monitoring and maintenance

☐ Higher quality, more consistent products

☐ More efficient resource use, specify: _____

Others:

company's image improved?

☐ Yes

☐ No

☐ Not applicable

changes in the work culture among staffs?

☐ Yes

☐ No

☐ Not applicable

yes, how?

☐ Higher motivation

☐ Better communication/interaction

☐ Better knowledge about preservation, protection and improvement of the quality of environment

☐ Better knowledge about protection of human health

☐ More willing to work in teams

duration of preparing for certification

_____ months

_____ months

_____ months

_____ months

_____ months

_____ months

Who is responsible for establishing the EMS?

☐ internal staff

☐ external expertise (consultant)

External expertise used, for which stage and was it local or foreign consultants?

Local

Foreign Consultant

Whole system

to conduct initial environmental review

for environmental legal requirements

for environmental monitoring

Others, please specify:

Is a special person assigned solely to ISO 14001 project?

Yes ☐

No ☐

If yes, specify his/her title:

Which department is overall in-charged?

Who prepares the

environmental manual?

Specify title of position)

Company operating procedures?

Work instructions?

Estimated cost spent on ISO 14001 certification

Less than 10,000

10,000 - RM 39,999

40,000 - RM 79,999

80,000 - RM 99,999

100,000 - RM 149,999

150,000 - RM 199,999

More than 200,000

Breakdown (%) of cost incurred while preparing for ISO 14001 certification

External expertise (exclude training)

_____ % (estimate)

Equipment (for example, air monitoring, lab tests, etc)

_____ % (estimate)

Training (for example, upgrading of equipment and facilities)

_____ % (estimate)

Installation and purchase (for example, new installation and

_____ % (estimate)

of equipment and facilities)

Installation cost

_____ % (estimate)

Other matters

_____ % (estimate)

_____ % (estimate)

_____ % (estimate)

Problems encountered during implementation for different levels of employees (you may tick in more than 1 box)

	Top Management	Middle/Junior Management	Operational /Technical Staffs	Administrative Staffs
Lack of know-how on EMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resistance from staffs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficult to interpret ISO 14001 std.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feel that too much of documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficult to understand local legalisations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Don't know how to set objectives and targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty in training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of fund (above budget)		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Lack of communication		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Issues, among who?	<input type="checkbox"/>	Consultant and management		
	<input type="checkbox"/>	Management and management		
	<input type="checkbox"/>	Management and staffs (non-management)		
	<input type="checkbox"/>	Staffs and staffs		

adequate measures have been taken in the following environmental aspect?

Contribution to the atmosphere, smoke and gas emission	<input type="checkbox"/> If not, why? _____
Air Pollution	<input type="checkbox"/> If not, why? _____
Discharge of wastes, sewage and industrial effluents	<input type="checkbox"/> If not, why? _____
Radioactive and hazardous wastes	<input type="checkbox"/> If not, why? _____
Soil and ground water protection	<input type="checkbox"/> If not, why? _____

Company Set-up

of establishment

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Total numbers of employees

- 50
- 99
- 0-199
- 0-299
- 0-499
- 0-799
- 0-1000
- 000

Annual turnover (RM million)

- 9
- 49
- 99
- 199
- 499
- 00

Does your company operates a ISO 9000 system?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------

If yes, is it ISO9001 or ISO 9002?

<input type="checkbox"/> ISO9001	<input type="checkbox"/> ISO9002
----------------------------------	----------------------------------

: _____

: _____

Appendix 5

Kruskal Wallis Test

(A) To test the hypothesis that the cost spent on ISO 14001 certification are the same for firms regardless of their size (in terms of number of employees)

Test Statistics

Chi-Square	3.436
df	5
Asymp. Sig.	.633

Decision: There is insufficient evidence to reject the null hypothesis (there is no significant difference in the cost spent on ISO 14001 certification for different sizes of firms).

(B) To test the hypothesis that the certification preparation duration are the same for firms regardless of their size (in terms of number of employees)

Test Statistics

Chi-Square	8.381
df	5
Asymp. Sig.	.136

Decision: There is insufficient evidence to reject the null hypothesis (there is no significant difference in the certification preparation duration for different sizes of firms).

(C) To test the hypothesis that the average cost spent are the same for different preparation duration

Test Statistics

Chi-Square	4.836
Df	4
Asymp. Sig.	.304

Decision: There is insufficient evidence to reject the null hypothesis (there is no significant difference in the cost spent for different preparation duration).

Appendix 6

Kruskal Wallis Test

To test the hypothesis that the certification preparation duration are the same for companies with different number of establishment year

Test Statistics

Chi-Square	6.126
Df	2
Asymp. Sig.	.047

Decision: There is sufficient evidence to reject the null hypothesis (there is a significant difference in certification preparation duration for companies with different number of establishment year).

Means Report - Average duration (months)

No. of establishment year	Mean preparation duration	N	Std. deviation
5.00	12	4	0.00
10.00	15.6	5	3.29
20.00	16.0	9	4.24
Total	15.00	18	3.71

Appendix 7

Factor Analysis : Reason for an EMS implementation

Total Variance Explained

Component	Initial Eigenvalues			Extraction SS Loadings			Rotation SS Loadings		
	Total	% of Var.	Cum.%	Total	% of Var.	Cum.%	Total	% of Var.	Cum.%
1	2.36	29.50	29.50	2.36	29.50	29.50	1.77	22.10	22.10
2	1.60	19.95	49.45	1.60	19.95	49.45	1.76	22.02	44.11
3	1.28	16.03	65.48	1.28	16.03	65.48	1.71	21.37	65.48
4	0.89	11.08	76.56						
5	0.79	9.83	86.39						
6	0.63	7.83	94.22						
7	0.34	4.30	98.52						
8	0.12	1.48	100.00						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix

Implementation Reasons	Component		
	1.00	2.00	3.00
Moral/corporate responsibility	0.82	-0.13	0.23
Business strategy to achieve competitive edge	0.51	0.43	-0.26
Customers' requirement	0.28	-0.54	0.54
Stakeholders' requirement	-0.01	0.08	0.70
Remain competitive in global marketplace	0.83	0.29	-0.27
Influence from parent company	0.14	0.05	-0.83
Encouragement from the government	0.00	0.88	0.16
It is just a good practice	0.21	0.63	-0.06

Extraction Method: Principal Component Analysis.

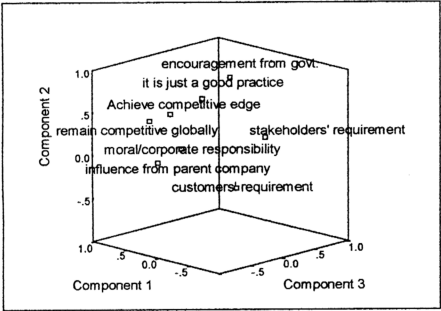
Rotation Method: Varimax with Kaiser Normalization.

- Factor 1: To achieve competitive advantage
- Factor 2: Expected incentives
- Factor 3: Influence from authoritative parties

Component Transformation Matrix

Component	1.00	2.00	3.00
1	0.53	0.66	-0.53
2	0.77	-0.11	0.63
3	-0.36	0.74	0.57

Component Plot in Rotated



Appendix 8

Chi – Square Test

Statement 1: "ISO 14001 benefits my company"

	Observed N	Expected N	Residual
disagree	2.0	4.5	-2.5
neutral	1.0	4.5	-3.5
agree	3.0	4.5	-1.5
strongly agree	12.0	4.5	7.5
Total	18.0		

Statement 2: "ISO 14001 certification means a good performance of a company"

	Observed N	Expected N	Residual
disagree	3.0	4.5	-1.5
neutral	3.0	4.5	-1.5
agree	5.0	4.5	0.5
strongly agree	7.0	4.5	2.5
Total	18.0		

Test Statistics

	Statement 1	Statement 2
Chi-Square	17.11	2.44
df	3.00	3.00
Asymp. Sig.	0.00	0.49

Decision: There is a significant difference in the degree of agreement of the respondents in whether ISO 14001 certification benefits their companies.

Majority strongly supported this.

However, we cannot conclude whether the respondents significantly agree or disagree with the statement " ISO 14001 certification means good performance of a company".

Appendix 9

Chi – Square Test

Third party registration is necessary for a successful EMS implementation

	Observed N	Expected N	Residual
strongly disagree	1	3.6	-2.6
disagree	3	3.6	-.6
neutral	3	3.6	-.6
agree	3	3.6	-.6
strongly agree	8	3.6	4.4
Total	18		

Test Statistics

Chi-Square	7.556
df	4
Asymp. Sig.	.109

Decision: There is not significant difference in the degree of agreement on whether third party registration is necessary for a successful EMS implementation.

Appendix 10

(A) Factor Analysis

Rotated Component Matrix	Component		
	1	2	3
better business control	.930	.116	-.019
transparency/openness	.256	.806	.022
marketing advantages	.941	.175	.001
cost reduction	.657	.537	-.028
less injuries/environmental accidents	-.020	.912	.067
more research and development	.798	.153	.477
improvement in operations efficiency	.209	.696	-.100
company's image improved	-.159	-.143	.894
changes in work culture	-.186	-.123	-.457

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Factor 1: Competitive advantage in product/service

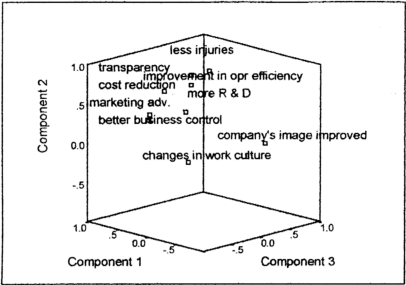
Factor 2: Effective operations

Factor 3: Enhanced company's image

Component Transformation Matrix

Component	1	2	3
1	.796	.597	.101
2	-.531	.768	-.359
3	-.292	.232	.928

Component Plot in Rotated



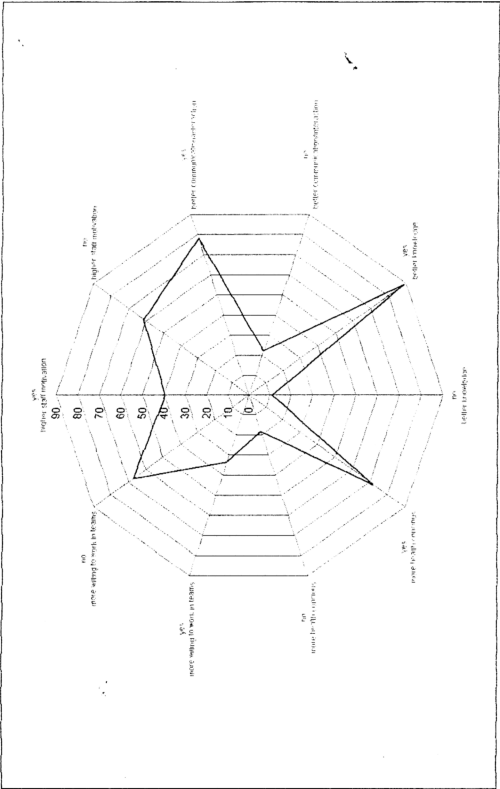
(B) Kruskal Wallis Test

To test the null hypothesis that there is no significant difference in industry for each of the benefit respectively.

	Chi-Square	df	Asymp. Sig.
better business control	8.14	4	0.09
transparency/openness	0.38	4	0.98
marketing advantages	5.80	4	0.21
cost reduction	2.35	4	0.67
less environmental accidents	0.82	4	0.94
more research and development	5.93	4	0.20
improvement in operations efficiency	2.75	4	0.60
company's image improved	0.38	4	0.98
changes in work culture	0.38	4	0.98

Decision: There is insufficient evidence to reject the null hypothesis. Hence, there is no significance difference in the industry type for each of the benefit.

Appendix 11



Appendix 11

(A) Factor Analysis

Rotated Component Matrix

	Component			
	1	2	3	4
lack of know-how on EMS	-.891	.206	.319	-.231
resistance from staffs	.841	-.155	.494	-.106
difficult to interpret standards	-.080	.846	.123	-.448
too much documentation	-.001	.169	.980	.010
difficult to understand legalisations	.219	-.043	.097	.963
don't know how to set obj. and targets	.937	-.248	.066	.167
difficulty in training	.978	-.151	-.017	.138
lack of fund	-.246	.959	.067	.065
lack of communication	-.246	.959	.067	.065

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Factor 1: Lack of training

Factor 2: Lack of commitment

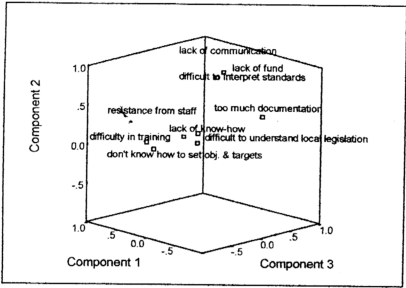
Factor 3: too much documentation

Factor 4: Lack of knowledge on local legislations

Component Transformation Matrix

Component	1	2	3	4
1	-.788	.578	.027	-.212
2	.510	.705	.485	.086
3	-.316	-.375	.832	.258
4	-.137	.169	-.267	.939

Component Plot in Rotated



(B) Kruskal Wallis Test

To test the null hypothesis that there is no significant difference among the industry type with respect to each of the problem.

Problems	Chi-square	df	Asymp. Sig
lack of know-how on EMS	3.95	4	0.41
resistance from staffs	2.97	4	0.56
difficult to interpret ISO 14001 standards	0.33	3	0.95
too much documentation	2.19	4	0.70
difficult to understand local legalistions	2.04	2	0.36
don't know how to set objectives and targets	2.34	3	0.50
Difficulty in training	0.55	2	0.76
Lack of fund	1.87	4	0.76
Lack of communication	1.87	4	0.76

Decision: There is insufficient evidence to reject the null hypothesis. There is no significant among industry type for each of the problems faced.