

Declaration



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This thesis is submitted to the Unitec Graduate School in partial fulfilment of the requirements for the degree of Master of Computing, Unitec, New Zealand, 2009.

Candidates Declaration:

I confirm that:

This thesis represents my own work

The contribution of supervisors and others to this work is consistent with the Unitec Regulations and Policies;

Research for this work has been conducted in accordance with the Unitec Research Committee Policy and Procedures, and has fulfilled any requirements set for this project by the Unitec Research Ethics Committee Research Ethics Approval Number 2008:

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"Towards implementing a 'Green' ICT environment: Attitudes of selected New Zealand small businesses"

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(31st August, 2009)

Abstract

The aim of this research was to discover the actual attitudes of the Respondents with regard to 'Green' issues and to develop an understanding of the level of knowledge they each have of the current issues, regularly advertised through various media outlets. In addition, to identify what measures if any the Respondents have already instigated for themselves. A multiple case study methodology was used, using the case study research strategy. A mixed method approach was employed using quantitative and qualitative data analysis processes. The sample size was 10 New Zealand small businesses, each representative of a different industry sector, based in Tauranga, New Zealand. The Respondents computer literacy ranged from the lower to upper spectrums, and the majority of the Respondents gained that knowledge and experience by being Self-taught. The range of ICT used in each Respondents business was investigated. The Respondents are not only concerned about, but have a reasonable understanding of 'Green' concepts. Most of the Respondents have instigated various aspects of recycling, including the use of recycled ink cartridges, recycling surplus ICT; and making every attempt to dispose of ICT using the most eco-friendly method available, as opposed to disposing of ICT devices in a local landfill. The majority of Respondents have implemented energy conservation by turning ICT devices and lighting off when not in use. Most of the Respondents place the responsibility of CO₂ emissions produced by manufacturing processes, firmly on the shoulders of big business, but did not realise that ICT produces 2% of the earths CO₂ emissions.

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Table of Contents

Abstract	i
Acknowledgements	ii
Abbreviations	xii
Definitions	xii
Chapter One	1
1: Introduction	2
1.1: Methodology	5
1.1.1: Researcher bias	5
1.2: Scope of Research	5
1.3: Research Question	6
1.3.1: Sub question 1 - What are the main criteria when purchasing ICT?	6
1.3.2: Sub question 2 - Are SME's concerned about 'Green' ICT issues	6
1.3.3: Sub question 3 - What do SME's know about recycling?	6
1.4: Researcher's own first-hand SME, ICT experience	7
1.4.1: Brief history of ICT used in the researcher's SME	7
1.4.4: Broadband internet, banking, and e-mail	7
Chapter 2	8
2: Literature Review	9
2.1: The New Zealand Government's ICT agenda	9
2.2: Geographical locations	11
2.3: Economic disparity, lack of knowledge and resources	12
2.3.1: Product Lifespan	13
2.4: ICT and e-Responsibility	22
2.5: Consequences of E-waste on the environment	23
2.5.1: Basel Convention – Hazardous waste and e-Waste	23
2.6: Carbon emissions (CO ₂)	25
2.6.1: NZ Government and the Kyoto Protocol	25
2.6.2: ICT manufacturing and greenhouse gases	25
2.6.3: SME ICT usage and greenhouse gases	26
2.6.4: Carbon Credits in conjunction with NZ SME	27
2.7: ICT and Energy types	27
2.7.1: Electrical energy	27
2.7.2: Un-interrupted power source (UPS / battery power)	28
2.7.3: Solar energy	29
2.8: Chapter summary	30

2.8.1: What are the main criteria when purchasing ICT?	30
2.8.2: Are SME's concerned about 'Green' ICT issues	30
2.8.3: What do SME's know about recycling?	31
Chapter Three	33
3: Methodology and research methods	34
3.1: Introduction	34
3.2: Methodology	35
3.3: A multiple case study, using the case study research strategy	35
3.4: The time-horizon using the mixed method choice	36
3.4.1: Quantitative method	36
3.4.2: Qualitative method	37
3.4.3: Triangulation	40
3.4.4: Storage of confidential material	41
3.4.5: Dispersal and disposal of confidential material	41
3.4.6: Disclosure of findings	41
Chapter Four	42
4: Findings	43
4.1: Introduction	43
4.2: Demographics	45
4.2.1: Where is this business sited?	45
4.2.2: What industry sector identifies your SME?	45
4.2.3: What is your role in this business?	46
4.2.4: What gender are you?	46
4.2.5: How many staff are employed by your business?	47
4.2.6: What hours do staff work?	48
4.3: ICT demographics	51
4.3.1: Does your SME use ICT in every day business practices?	51
4.3.2: Please explain why this SME does not use ICT?	52
4.3.3: What ICT is available to be used by the staff on a daily basis?	52
4.3.4: How many computers would be used on a daily basis?	54
4.3.5: How many hours per day is each computer switched on for?	57
4.4: IT Section	58
4.4.1: Do you need to consult with an IT professional to upgrade ICT?	58
4.4.2: Who is responsible making purchasing and disposing of ICT?	58
4.4.3: What knowledge and level of experience of ICT?	59
4.4.4: How did you gain this knowledge and experience?	59
4.4.5: How many years experience do you have?	61
4.5: Purchasing ICT	61

4.5.1: On an average how often do you upgrade your ICT?	61
4.5.2: What is your personal attitude towards sustaining “Green” ICT?	62
4.5.3: How important is it to your business to be eco- friendly?	62
4.5.4: The importance to support other eco-friendly businesses?	63
4.5.5: Do you believe it is important to create an eco-friendly workplace?	63
4.5.6: What policies are created for an eco-friendly workplace?	64
4.5.7: What future policies are to be created for an eco-friendly workplace?	67
4.5.8: Why do you believe it is not important for an eco-friendly workplace?	68
4.5.9: With new ICT do you use the following specifications?	68
4.5.10: Please select those items that you consider to be important?	69
4.5.11: Do you consider the energy requirements of new ICT?	69
4.5.12: Take into consideration the CO ₂ emissions of new ICT?	70
4.5.13: Take into consideration the recyclable specifications of ICT?	70
4.5.14: Are there any other comments you wish to add?	71
4.5.15: How would you rank purchasing ‘Green’ ICT?	71
4.5.16: ICT professionals obligation to promote ‘Green’ specifications?	71
4.5.17: IT supplier choice of if offered recycling options	72
4.5.18: How cost effective is it to be eco-friendly?	72
4.6: Ink cartridge recycling and refill services	73
4.6.1: How do you see the importance of using refill services?	73
4.6.2: Do refilling services provide a cheaper and easier option?	73
4.6.3: If given the option which choice does your SME take?	74
4.6.4: Would you consider a pick and delivery service?	74
4.6.5: Would you use a pre-refilled item if available?	74
4.7: Disposal of ICT equipment	75
4.7.1: Is this equipment taken off the business premises?	75
4.7.2: Do you dispose of the ICT equipment yourself?	75
4.7.3: How does your SME dispose of this equipment at present?	76
4.7.4: What measures are taken to avoid poisonous leakage?	76
4.7.5: Where do you store this equipment if not dispose of it?	77
4.7.6: Whom do you get to take the equipment off the premises?	78
4.7.7: Are you aware of what happens to this equipment?	79
Chapter 5 - Discussion	80
5.1: Introduction	81
5.2: Qualitative data using narrative analysis	82
5.3: Part 3 – Qualitative analysis	83
5.3.1: Other ICT used	83
5.3.2: How many hours per day is computer on for?	88

5.3.3: Need to consult with an I.T professional to implement new ICT?	92
5.3.4: Who is responsible for purchasing and disposing of ICT?	93
5.3.5: What knowledge and level of ICT experience do you have?	95
5.3.6: How did Respondents gain ICT knowledge and experience?	96
5.4: Part 4 – Purchasing ICT - Qualitative analysis	98
5.4.1: On average how often, do you upgrade your ICT?	98
5.4.2: What is your personal attitude to sustaining 'Green' ICT?	99
5.4.3: How important is it to your business be eco-friendly?	102
5.4.4: To be seen supporting other eco-friendly businesses?	104
5.4.5: Select energy items important to sustain 'Green' ICT	106
5.4.6: Take into consideration the energy requirements of new ICT?	108
5.4.7: Take into consideration the carbon emissions of ICT?	109
5.4.8: Take into consideration the recyclable specifications of new ICT	111
5.4.9: Importance of recommendations to purchase new Green ICT	113
5.4.10: Sales obligation to promote and provide 'Green' specifications	115
5.4.11: Can the return of ICT influence in your choice of IT supplier	117
5.4.12: How cost effective is it to be environmentally friendly?	119
5.5: Part 5 - Refill services	121
5.5.1: The importance of refilling items such as ink cartridges?	121
5.5.2: Do re-filling services provide a cheaper and easier option?	123
5.5.3: Would you consider a pick up and delivery service?	125
5.5.4: Would you use a pre-refilled item if this service were available?	127
5.6: Part 6 Disposal of outdated / redundant / broken ICT	128
5.6.1: Is this equipment taken off the business premises?	128
5.6.2: Do you dispose of the redundant equipment yourself?	129
5.6.3: How does your business dispose of this equipment at present?	131
5.6.4: What measures are undertaken to protect the environment?	132
Chapter Six	134
6: Conclusions	135
6.1: Introduction	135
6.2: Research sub-questions	136
6.2.1: Sub-question 1 - What are the main criteria when purchasing ICT?	136
6.2.2: Sub-question 2 - Are SME's concerned about 'Green' ICT issues	142
6.2.4: Sub-question 3 - What do SME's know about recycling?	149
6.3: Comparison of Genders versus ICT experience	155
6.5.1: Female versus male Respondents	155
6.4: Recurring themes	157
6.5: Other areas of research	158

6.5.1: How long it will take before facsimiles become obsolete	158
6.5.2: IT Professionals 'eco-friendly' principals	158
6.6: In conclusion	158
7: References	159
8: Appendix	167
8.1: Appendices A – Research engine (Questionnaire)	167
8.2: Appendices B – Questionnaire Comments	181
8.3: Appendices C - Personal Reflection on my study	195

List of Figures

Figure 1: Illustration of the ICT Product Lifespan	13
Figure 2: Size and weights of cell phone technology from 1986 to 2008	14
Figure 3: Processes behind the research design	35
Figure 4: Reflective and critical thinking	39

List of Tables

Table 1: The industry sectors	45
Table 2: Role in the business	46
Table 3: Number of staff employed	47
Table 4: Staff employment categories	48
Table 5: Full-time staff	49
Table 6: Part-time staff	49
Table 7: Casual staff	50
Table 8: Other assistants	50
Table 9: The Other categories of assistants	51
Table 10: Daily use of ICT by SME's	51
Table 11: No daily use of ICT	52
Table 12: Computers used daily	52
Table 13: SME's use of LAN	53
Table 14: ICT used daily in by SME's	54
Table 15: Number of computers used daily	56
Table 16: Hours per day desktop PCs are on	57
Table 17: Hours per day Laptops are on	57
Table 18: Hours per day Servers are on	58
Table 19: Use of ICT professionals	58
Table 20: Responsible for ICT decisions	58

Table 21: Knowledge and experience	59
Table 22: How Respondents gained their computer skills	59
Table 23: Years of ICT experience	61
Table 24: ICT upgrades	61
Table 25: Personal attitudes 'Green' ICT	62
Table 26: Be an eco-friendly business	62
Table 27: View of supporting eco-friendly businesses	63
Table 28: Create an eco-friendly workplace	63
Table 29: Current SME's business policies	64
Table 30: Future SME's business policies	67
Table 31: Specification option selected	68
Table 32: Respondents energy preferences	69
Table 33: Energy requirements of new ICT	69
Table 34: CO ₂ emissions of new ICT	70
Table 35: Consideration of recyclables	70
Table 36: Purchasing/ hiring 'Green' ICT	71
Table 37: IT professionals promote 'Green' ICT	71
Table 38: Companies offering recycling options	72
Table 39: Cost effectiveness and 'Green'	72
Table 40: Importance of using refill cartridge services	73
Table 41: Cheaper ink cartridges	73
Table 42: Ink cartridge decisions	74
Table 43: Use a pick-up and delivery service	74
Table 44: Pre-refilled replacement decisions	74
Table 45: Removal of ICT equipment	75
Table 46: Disposal of ICT equipment	75
Table 47: How SME's dispose of ICT	76
Table 48: Special measures to protect environment	76
Table 49: Where the ICT equipment is stored	77
Table 50: Removal of ICT equipment from business premises	78
Table 51: Respondents awareness of ICT recycling principals	79
Table 52: Align Respondent with computer category	82
Table 53: Other ICT used by Respondents themes	84
Table 54: Respondents responses to their computer usage	88
Table 55: Hours computers used themes	90
Table 56: ICT implementation decisions	92
Table 57: Who makes ICT decision themes	92
Table 58: Purchase and disposal of ICT	93

Table 59: Purchasing and disposing of ICT themes	94
Table 60: Knowledge and level of experience	95
Table 61: Computer knowledge and experience themes	96
Table 62: Gain ICT knowledge and level of experience	96
Table 63: Gain ICT knowledge and experience themes	97
Table 64: Average time for businesses to upgrade ICT	98
Table 65: Upgrade ICT themes	99
Table 66: Personal attitudes to sustaining 'Green' environment	99
Table 67: Personal attitude eco-friendly themes	100
Table 68: The importance to be seen to be an eco-friendly business	102
Table 69: Being an eco-friendly business themes	103
Table 70: Support of other eco-friendly businesses	104
Table 71: Support of other eco-friendly businesses themes	105
Table 72: Important energy to sustain Green ICT	106
Table 73: Energy items to sustain 'Green' ICT themes	107
Table 74: Consideration of the energy requirements of new ICT	108
Table 75: Energy requirements of new ICT themes	108
Table 76 : Consideration of carbon emissions of ICT	109
Table 77: ICT Carbon emissions themes	110
Table 78: ICT recyclable specifications	111
Table 79: ICT recyclable specifications themes	112
Table 80: Recommendation to purchase Green ICT	114
Table 81: Recommendation to purchase Green themes	114
Table 82: Promote and provide Green ICT specifications	115
Table 83: Promote and provide green specifications themes	116
Table 84: Return of ICT influence choice of IT supplier	118
Table 85: Return of ICT influence choice of IT supplier themes	118
Table 86: Is it cost effective to be eco friendly	119
Table 87: Is it cost effective to be eco-friendly themes	120
Table 88: Importance of services that refill items	121
Table 89: Importance of services that refill item themes	122
Table 90: Refilling services provide cheaper and easier options	123
Table 91: Re-filling provide cheaper and easier option themes	124
Table 92: Cartridge pick up and delivery service	126
Table 93: Pick up and delivery service themes	126
Table 94: Use of re-refilled cartridges	127
Table 95: Use of re-refilled cartridge themes	127
Table 96: Is equipment taken off the business premises	128

Table 97: Equipment taken off business premises themes	129
Table 98: Disposal of redundant / broken ICT	129
Table 99: Disposal of redundant / broken ICT themes	130
Table 100: Present disposal methods of ICT	131
Table 101: Present disposal methods of ICT themes	131
Table 102: Measures undertaken to protect the environment	132
Table 103: Measures undertaken to protect environment themes	132
Table 104: Individual recycling practices	150

List of Charts

Chart 1: SME districts	45
Chart 2: Gender of the SME ICT person	46

Abbreviations

Broadband Investment Fund	BIF
Carbon emissions	CO ₂
Central Business District	CBD
Digital Strategy Document	DS doc
Electronic waste	e-Waste
European Union	EU
Growth and Innovation Framework	GIF
Information and Communications Technology	ICT
Local Area Networks	LAN
New Zealand	NZ
New Zealand Government	NZ Govt
Nitrogen trifluoride	NF ₃
Point of Sale	POS
Small to Medium sized Enterprise ('s)	SME ('s)
Sulfuryl fluoride	SO ₂ F ₂

Definitions

End-of-Life ICT	Information and Communications technology that is either outdated, redundant or broken
e-Responsibility	For ICT users to share the responsibility (and costs), for minimising and managing e-waste
CBD	The area comprising the hub of the Tauranga city business centre (Rosenburg, 2008)
Suburbs	Residential communities on the outskirts of a city (Mc Leod, 1987, p.1002)
Research instrument	Questionnaire

Chapter One

1: Introduction

This research project sets out to determine what the actual attitudes of SME owners /managers or their ICT representative, based in Tauranga, are in regards to how they see the importance of implementing a 'green' ICT environment.

The Researchers definition of Green ICT in this research is:

Firstly how SME's use computers and telecommunications in as an energy efficient manner which will lessen the impact on the Earth's natural resources and secondly, how SME's recycle their ICT, to be re-used or re-manufactured in an eco-friendly manner that will lessen the overall impacts of ICT component toxicity on our environment.

All ICT users can choose whether they wish to partake in the role of protecting our environment or not. Continuing media coverage of environmental issues, such as product advertising, increased costs for power consumption, new appliance energy star label ratings and energy star charts, or providing education on topic related issues would assist the ICT user to become more conscientious about the amount of energy each device uses and how that device is used. For example, if we turn this computer off at the end of the working day, how many kWh will this save our business annually? The mutual efforts of everyone involved will take us a long way towards creating a sustainable future for both the environment and ICT as a whole.

Current research indicates that ICT is playing an increasing role in our daily activities here in New Zealand (NZ) as well as on a global scale. Coupled with the increasing numbers of ICT users, ICT and the impacts of ICT now leave their influence on the earth's environment. Environmental issues such as CO₂ emissions, natural resource depletion, and what we do about electronic waste (e-waste) have to be addressed. There are a number of reasons ICT products fall under this category, and these reasons are discussed in the literature review (Brown-Santirso and Fu, 2008, p. 2).

The New Zealand Government (NZ Government) is one of the developed nations that signed the Kyoto Protocol in 1997, and re-signed for the commitment period commencing, January 2008. The NZ Government is fully committed to all facets involved in the production / implementation and use of any product, where by the nature of their manufacturing process or use, produce unacceptable bi-products, which leave a negative impact on our environment (e-day, 2008a).

New Zealanders are now familiar with the terminology of CO₂ emissions, and the concerns about the effect that CO₂ emissions have on our environment. This awareness has come about from publicity generated through various media outlets that include newspaper articles (Reuters, 2008), television and radio broadcasts (TVNZ, 2009a), watching a movie such as 'An Inconvenient Truth' (Guggenheim, 2006) or by using the internet and reading on-line articles.

One example is the article written by Grey (2008) that provides one theory that global warming is a fraud. Experts from a variety of subjects, suggest that CO₂ emissions are the major cause of global warming.

"The greenhouse gases act like a blanket over the surface of the Earth, keeping it around 20 centigrade degrees warmer than it otherwise would be, the phenomenon is known as the greenhouse effect." (The Royal Society, 2005, p. 6 ¶ 3)

Global warming and the effects of global warming are the current "buzz word," although it is not a new concept as Grey (2008) discovered. During the research process, information confirmed a Swedish chemist named Arrhenius, was the first to come up with the theory of global warming in 1865. Through his research, the author Grey discovered in 1865 that Arrhenius not only recognised that human emissions would ultimately have a negative impact on the earth's environment but also understood that those emissions over time, would affect climatic conditions. The author Grey explains that his fellow peers threw out Arrhenius theory on global warming along with the theory of the humans' ability to damage our own environment (p. 2).

Now if you come back to the present-day, early 2008-2009, the topic of global warming appears to have completed a full cycle. The world experts have no definite conclusions drawn as to exactly what is happening to our planet, and why we are witnessing such extremes in temperatures and climate conditions. Grey (2008, p. 3) provides one example of determining where academic thought presently lies with his research paper entitled 'The global warming scam'. In his research paper, the author argues that what the earth is experiencing at present may just be another stage of the earth's evolution and suggests below that it is unfeasible to perform scientific tests in order to prove or disprove global warming theories as:

"It is not possible to measure the average temperature of the earth's surface. To do so would involve placing thermometers or other measuring equipment in a random and representative fashion over all parts of the surface, including the 71% that is ocean.

Since this is currently impossible, it is equally impossible to find if the average temperature is increasing. Also it is not possible to measure the average greenhouse gas concentration over all parts of the earth's atmosphere by placing measuring equipment randomly throughout (Grey, 2008, p. 3 ¶1)."

While Sweet (2006) presents the other side of the argument, which suggests a humans high dependency on energy is a contributing factor towards global warming. Sweet's article provides this example where fossil fuels such as coal, mined from under-ground sources in numerous countries including NZ, have both the positive and hidden negative effects. One positive feature is coal is available in large amounts and can supply energy resources from now and into the future. While on the other hand, one negative impact is the CO₂ emissions released into the atmosphere through the combustion of the fuel (p. 28).

In order to meet this end, a group of energy companies within NZ met and agreed to form a joint venture named Power Savers, where their primary goal was to promote and educate consumers in how to lower their energy consumption countrywide. Their advertising campaign, run in the autumn of 2008 really caught the attention of the consumer. This campaign ran over the period where low rainfall was affecting the water levels in our hydro lakes, from mid autumn to early winter (Power savers, 2008).

Like any new venture, initial purchasing of ICT and implementation costs can be high. Depending on your requirements in regards to the use of ICT, procuring ICT can be an expensive liability for a SME, as ICT is described as an innovative technology that sets out to meet the changing needs of ICT users (Locke, 2003, p. 94).

An on-going headache for management and householders alike is the question of what do we do with the redundant or surplus ICT or e-waste? Working ICT is recycled to another area where there is a lower demand on the slower technology (Computer recyclers, n. d.). Multiple items can be sold at ICT auctions. Linde (personal communication, October 15, 2008) suggests the ICT suppliers and companies regularly replacing larger quantities of ICT such as the Bay of Plenty Polytechnic (BOPPPLY) or the financial investment company 'ABN Amro Craig's' hold regular actions to sell their surplus ICT.

Broken ICT is another story altogether. The in-built components are manufactured from materials that leach toxic substances into the environment. The impact of e-waste has become a major global environmental concern. ICT users have to develop e-Responsibility for any e-waste they may own as defined by the Zero Waste Trust (2009) and Mac Gibbon and Zwimpfer (2006, p. 11) how most of NZ e-waste is disposed of in landfills.

The secondary purpose behind this research is to identify what SME owners/ managers/ representatives consider important environmental and business considerations when using ICT in daily business activities.

The sub-questions were identified as a necessity in order to fully understand how Respondents feel about specific topics but also how they actually handle the issues from a both a personal and business perspective.

1.1: Methodology

Used in this research project is the mixed method methodology, which involved using both quantitative and qualitative data gathering methods. The researcher believed that using the quantitative research instrument in conjunction with using the qualitative narrative analysis on transcripts of the interviews, would deliver superior valid data.

1.1.1: Researcher bias

As having been the owner of a partnership owned SME, the researcher discusses in Section 1.4, the use of ICT used in their SME.

1.2: Scope of Research

The scope of the research includes gathering information from local Tauranga businesses where:

The use of the questionnaire will provide a basis, followed by individual interviews with each Respondent, which will enable this researcher and the SME owners/ managers to identify what the ICT demands of their daily business practices are.

1.3: Research Question

"Towards implementing a 'Green' ICT environment: Attitudes of selected New Zealand small businesses"

1.3.1: Sub question 1 - What are the main criteria when purchasing ICT?

1.3.2: Sub question 2 - Are SME's concerned about 'Green' ICT issues

1.3.3: Sub question 3 - What do SME's know about recycling?

1.4: Researcher's own first-hand SME, ICT experience

1.4.1: Brief history of ICT used in the researcher's SME

In 1976, the researcher and her husband Ian, brought an Upholstery business a small Sole Trader business. Initially the bookkeeping side of this business was paper based which meant that all workshop job cards were hand written as was the Book keeping system, which included receipts and customer invoices. The monthly Statement / Invoices were typed out using a mechanical typewriter (Salzberger & Freyburg, 1968). The business had used telecommunications technologies throughout. Examples included the use of a landline telephone and as the technology became available, the introduction of a mobile cell phone and facsimile device.

From the late 1990's this SME has fully embraced ICT that is now playing an increasing role in the daily business functions described below.

1.4.4: Broadband internet, banking, and e-mail

The introduction of broadband internet into this industrial area saw our business implement this technology. Customers now have the option of receiving their monthly invoice by e-mail. Prospective customers who view our website can use e-mail to discuss specifications for a particular task (Trimit, n. d.).

Cunliffe (2006) suggests that ICT users are becoming more confident when using ICT as a part of daily business functionality and Cherry-Anne Stenning (personal communication, March 15, 2009) confirms this by discussing how technology is automating office procedures such as using the calendar function of Microsoft Outlook Express daily for booking in a customer's job. E-mail is used successfully now as a first communication between banking, accounting, and legal companies. Internet banking facilities pay wages, transfer money between accounts, and pay business accounts (Sanders, Pauleen & Harmer, 2007, p. 5).

It is apparent after talking to both neighbouring SME owners and a range of other SME acquaintances from a variety of industries, that this SME is not the only progressive SME to have implemented a wide range of ICT into their everyday business functionality (Locke, 2003, p. 96).

Chapter 2

2: Literature Review

2.1: The New Zealand Governments ICT agenda

The New Zealand Government (NZ Government) is a modern and forward thinking governing body that understands the role ICT plays and will continue to play, in modern business practice. As such, the NZ Government has taken a proactive role in developing an ICT infrastructure that will assist all New Zealanders to become active ICT users.

Statistics NZ (2008a) have confirmed in their Household Economic Survey 2007 (HES), that one-fifth of all NZ households own several different types of computers. These could be a combination of desktop PC's or laptop computers. The total number of NZ households using ICT will continue to increase as the used devices are recycled to other family members, or NZ households purchase their first computers. Sanders et al. (2007, pp. 5-6) indicate that figures taken from the Business Practices Survey 2001 showed that 86% of SME's in NZ, now use computers and have a fast broadband connection for the internet. The proposed business function is to use the internet to communicate with both customers and suppliers, as well as access internet-banking facilities and run an electronic accounting system.

The authors Sanders et al. (2007), designate 96% of businesses in NZ as belonging to the business category small to medium enterprises (SME), and as such, this large number of SME's has an influence on the New Zealand economy (p. 6).

Unfortunately, the economical climate that NZ is currently trading under has seen cuts in funding across the board, made by the newly elected National Party government. As such, sacrifices to the NZ Government environmental policies have been announced as reported by McPherson (2009, p. 22). The Govt³ project is a casualty of the current economic climate.

Cunliffe (2008a, p. 2 ¶ 3) describes how the NZ Government has developed and implemented a number of ICT policies in order to achieve this goal for all New Zealanders because:

"Our vision of the future is that New Zealanders should be leaders in the digital world and use digital technologies, skills, and opportunities to contribute to a prosperous, sustainable, and vibrant society. No country has more to gain from the 'death of distance' than New Zealand."

Such is their commitment to get New Zealanders technology educated; the NZ Government has developed a Digital Strategy (DS doc) and Cunliffe (2008a, pp. 2 - 8) describes the steps that will get us there.

The DS Doc defines the three steps below that indicate how they are going to achieve this goal.

1. Unleashing the full potential of the interactive ubiquitous web:

Cunliffe (2008a) suggests it is the NZ Government intention to provide open access network connections that will allow a variety of different devices and networks such as educational institutions, to connect in order to gain access to a variety of digitally stored information such as *"historical, scientific and geospatial"* (p. 2 ¶ 5).

2. Using digital technologies to drive productivity and economic growth:

"Digital technologies offer New Zealand the opportunity to improve our productivity and our connectedness to the rest of the world. This Strategy focuses on spreading awareness of the potential of digital technologies and on providing the skilled people and secure environment that businesses need to be able to take full advantage of the technology. In addition, we are boosting funding for research and development and providing support for high-potential digital firms."

(Cunliffe, 2008a, p. 3 ¶1)

3. Bringing everyone on the journey:

By implementing an interactive digital environment, we ensure that New Zealanders gain greater control as well as making certain that all New Zealanders will be included in gaining benefits from the use of digital technology Cunliffe (2008a, p. 3).

One aim of the DS Doc is to ensure small towns with a population of 10,000 or greater and identified as using 76% of the telephone lines in NZ, have access to broadband speeds of 20 mega bytes per second (mbps) whilst 90% of NZ have access to 10 mbps (Cunliffe, 2008b).

In order for the NZ Government to fulfil these obligations, the following issues are recognised.

2.2: Geographical locations

Statistics NZ (2006c) confirms that NZ is a sparsely populated country, with the more heavily populated areas in the four main city centres of Auckland, Wellington, Christchurch, and Hamilton. The NZ Government recognised the necessity of expanding the availability of high quality internet from the CBD, out into the suburbs, and into rural communications so that all SME's can have access to these services (Cunliffe, 2008b).

Cunliffe (2008b) describes that the NZ Government, working closely with all local government bodies have initiated a Broadband Challenge Project where local government bodies are being encouraged to upgrade their regions telecommunications infrastructure in order to provide the community as a whole with fast broadband connection. In July 2009, New Zealand Prime Minister John Keys, announced that the New Zealand Government intended to spend 1.5 billion NZ dollars on upgrading broadband internet access for New Zealand internet users (TVNZ, 2009b)

The Bay of Plenty Council (a co-operative of the seven local body councils within this region), intends to achieve this goal by enabling the internet service providers to own the network. As part of the Town Planning proposal, amendments and expansion ducks are to be under new roading and accessed as demand dictates later on for fibre optic cabling in them. Cunliffe (2008b) suggested this scheme fell under the suitable category of a Broadband Challenge Project and if accepted would be funded under the conditions of the DS doc (Bay of Plenty Council, 2008, p. 1).

The 2008 Statistics NZ report confirms that NZ broadband users have increased to 891,000, as to March 2008. The Internet Service Provider Survey indicate 60 internet service providers provide broadband upload speeds of 128Kbps and 256Kbps and download speeds of 2Mbps to nearly 10Mbps have become the most popular consumer options (Statistics NZ, 2008b).

An example of one initiative funded by the NZ Government annual budget in 2008, and made available for business and community ICT development in order to improve the availability and quality of broadband internet is the Broadband Investment Fund (BIF). Included are urban, rural, and international connections. The Ministry of Economic Development (2007) on the official website for the DS doc identifies all 14 regions that receive funding for ICT development.

2.3: Economic disparity, lack of knowledge and resources

It is one thing to have the technology available to be used, but quite another to actually get the public educated enough to use it. The NZ Government understands that there are cultural barriers that can restrict the public's adoption of ICT. One such barrier is the economic barrier while another barrier is age (Cunliffe, 2008a, p. 38; Senior Net, 2009).

To encourage people living in a situation where they either do not have personal access to a computer, or lack the knowledge to use a computer, the NZ Government as part of its DS doc strategy, provides necessary funding for a number of community centres. In these community centres, both the ICT devices as well as any practical tuition is provided free of charge in order for people living in the local community to gain computer skills. Faye Grant (personal communication, December 8, 2008) discussed the opportunity that a centre providing community computing gave her, when she decided that she needed to up-date her computer skills so she could apply for employment. The ICT user while in the centre has the use of a teaching manual that provides step-by-step instructions for that ICT user to follow in order to fulfil specific tasks. Tutors are available for assistance if needed. ICT users of any age that do not have access to a computer or the knowledge in how to use a computer are eligible to enrol at these centres (Cunliffe, 2006).

Persons interested in providing free computer resources such as community representatives can apply for funding from charitable organisations such as the Eastern and Central Community Trust. The Eastern and Central Community Trust approved a grant to run community-computing courses in the central east coast area of NZ (Brimblecombe, 2003, p. 217), or another example of funding is provided by the NZ Government through various incentive programmes for ICT projects that are defined below:

In the Bay of Plenty, various educational funding options available will provide the community with the necessary resources once an application is accepted. One example is the Smart People Project that provides a grant for the local community to have access to free computer resources situated at the Bay of Plenty Polytechnic.

Also part of the Smart People Project are permanent venues situated at both Katikati and Te Puke as well as a mobile learning centre (a bus) that is fully equipped with IT resources and driven by Community Computing tutors from the Bay of Plenty Polytechnic (New Zealand Government, 2008b).

Another example is the Equivalent Full Time Student Fund (EFTS funding) provided by the Ministry of Education. This funding provides various educational institutions such as polytechnics, universities, colleges and some private educational institutions with the necessary funds to run a number of different NZQA courses at levels two and three, free for students who meet the entry criteria. Levels two and three computing courses fall into the required category for this funding. On successful completion of all the course requirements, the student receives their NZQA certification (NZQA, 2007).

2.3.1: Product Lifespan

Figure 1: Illustration of the ICT Product Lifespan (Tobias, 2008, p. 4)

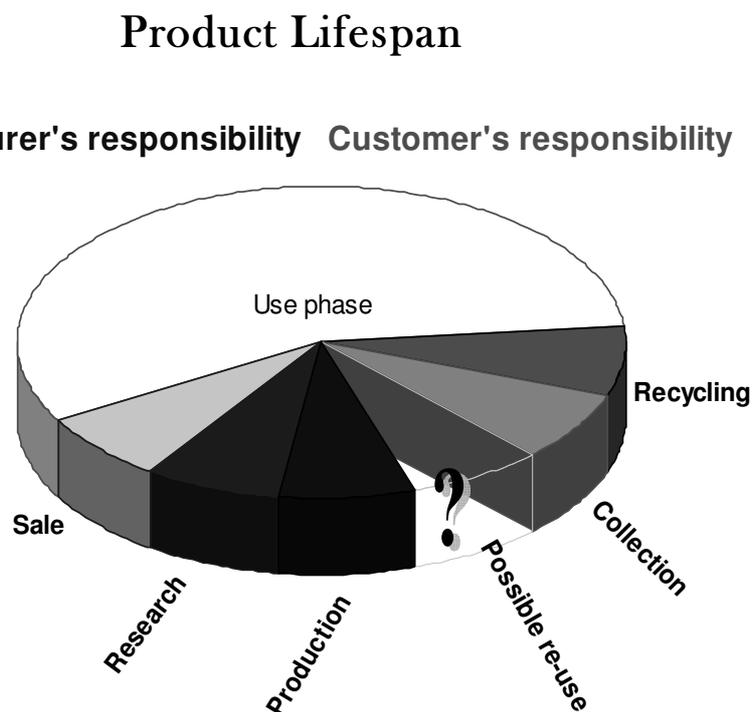


Figure 1 illustrates and assigns the two areas of responsibility of ICT ownership during its lifespan and places ownership into either the manufacturers' or the customers' domain. Starting with Research and development, and identifies the other lifespan cycles of Production, Sale, the Use-phase, Recycling, Collection and finishing with its end-of-life possible Re-use.

Due to the increased usage of ICT on a national and global scale, we as either the manufacturers or ICT users are now seeing the effects of how end-of-life ICT affects our environment.

"We have it in our power to begin the world over again." Thomas Paine (cited in Good Reads, 2009, ¶ 47). A statement that can be applied to cleaning up the effects of the current global warming situation.

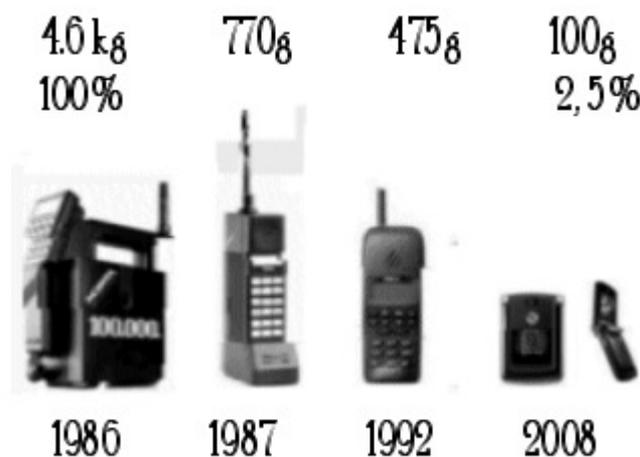
Research and Development

ICT developers have a responsibility to both the consumer and the environment to ensure that their devices fulfil every expectation. Two examples of such devices are the cell phone and the personal computer (pc).

Although emerging technology is creating devices that are becoming physically smaller (Tobias, 2008, p. 8), their design increases the features and functionality of each device.

Figure 2: Size and weights of cell phone technology from 1986 to 2008

(Tobias, 2008, p. 8)



The Pew Internet and American Life Project discussed research conducted by Howard Rheingold (cited in Brian, 2006, ¶ 1) as how we as consumers think about our cell phones.

"We think of them as mobile phones, but the personal computer, mobile phone and the Internet are merging into some new medium like the personal computer in the 1980s or the Internet in the 1990s."

For example, the researchers Motorola V3i cell phone which is considered to be a basic model, has standard functions which include a mobile telephone, a calculator, an alarm clock, an inbuilt camera, and can record video footage and send these files as an attachment with text messages. This cell phone can also connect to the internet and play music and games; as well as send, and receive e-mails (Motorola, 2009).

In comparison, many consumers are now using their personal computers as a communications device. Gone are the days of needing to use an external hand-held or a microphone headset whilst chatting pc to pc. Today there are many software applications available that used with the internal microphone in the computer will enable pc-to-pc communications or pc to telephone communications (Janan Bashir, personal communication, November 10, 2008). Janan demonstrated the VoIP soft-phone Just VoIP, which enabled him to dial his friend's cell or landline telephones with minimal call charges. Skype has the additional benefits of enabling users to use both audio and video features with no charges associated with its use (Skype 2009; United World, 2008).

Production

The consumer will have the option of buying one device that will perform multiple functions therefore reducing the need to purchase and maintain numerous ICT devices in the home.

ICT companies are aware of the increasing number of ICT's sold on a global scale. Large electrical companies such as Fuji Electric are incorporating energy saving options in the UP's devices used in conjunction with ICT devices (Tatsuhiko, Kaneda, & Kuneta, 2008, p. 42).

Other ICT companies such as Intel are working towards the development of European Union (EU) Restriction of Hazardous Substances (RoHS) compliant products. An example of a RoHS product is a lead free product. Intel reports that they developed a lead free processor in 2007, which fulfils the EU complaint category (Intel, 2007).

"The total energy and fossil fuels used in producing a desktop computer with 17-in. CRT monitor are estimated at 6400 megajoules (MJ) and 260 kg, respectively. This high energy intensity of manufacturing, combined with rapid turnover in computers, results in an annual life cycle energy burden that is surprisingly high: about 2600 MJ per year, 1.3 times that of a refrigerator." (Williams, 2004, ¶ 1)

Sales of ICT equipment

The latest figures released on April 20th, 2009, by Statistics NZ, show the results of the ICT Supply Survey as displayed below:

"Results from the ICT Supply Survey for the 2008 financial year, show that total sales of ICT goods and services were valued at \$19,346 million. The majority (\$17,935 million) were sold domestically, while \$1,412 million were sold to export markets.

Total ICT sales grew by 3 percent on the previous year's figure of \$18,787 million. This was driven by a 4 percent growth in domestic sales, while export sales fell by 8 percent."

(Bascand, 2009, p. 2, section 2 ¶ 1).

SME's continue to implement an ICT environment or improve on their existing ICT environments mainly due to the two reasons listed below:

One example is to support business activities such as office administration / financial issues, using accountancy applications such as Mind Your Own Business (MYOB, 2009), with the use of the internet for internet banking and payroll services (Sanders et al. 2007, pp. 5-6).

Sanders et al. (2007, p. 5) explain how SME's are expanding their current business activities by using the internet to advertise that business through webpage advertising, or by using online e-business practices, or using an internet feature such as Skype or Microsoft's Windows Live Messenger for business communication (Microsoft, 2009a; Skype, 2009).

Statistics NZ (2006, p. 29) reports that 61 % of SME's implement a local area network (LAN) which will enhance business practices, and will enable central data storage and shared file access. 21 % of SME's have implemented a company intranet that will enable other departments within the company to access the information available there (Sanders et al. 2007, p. 6).

Energy star ratings and energy efficiency

When it comes to new ICT product choice, consumers have a wide range of options available to them in order to select the right product. The range may include buying ready made - ready to install devices and extend through to purpose built devices.

The following ICT equipment defined by Bascand (2009, p. 13 ¶ 6) is included in the ICT Supply Survey and as such has to be approved for its energy efficiency and must display energy star labels.

"Computer and related equipment

This includes:

- *computers and other data processing machines*
- *computer printers, scanners, other peripheral units*
- *magnetic or optical storage units (eg CD or DVD drives)*
- *servers, routers, switches, structural cabling systems*
- *barcode scanners, EFTPOS machines*
- *computer parts and accessories (including printer cartridges; Not including covers, carrying cases or similar)"*

Winterford (2007, ¶ 5) suggests the following issues when consumers consider upgrading their ICT.

"When upgrading or introducing new technology, organisations should discuss energy efficiency with vendors -- many vendors have released great technology products."

The NZ Government (n.d.a) and HP (2009) suggest that consumers can gauge the energy efficiency of specific ICT equipment themselves, by interpreting the energy performance results displayed on the energy star label of each electrical device. In NZ, the Energy Efficiency and Conservation Authority (EECA) promote the energy star labels (Energy Efficiency and Conservation Authority, 2008).

Consumers purchasing laptop computers and thin client technology will not only appreciate the cost savings that they will experience from lower electricity usage, they will also acknowledge the benefits that implementing this technology has on the environment (HP, 2009).

MIT (n. d., p. 2) confirms that a personal computer switched off for 14 hours each day will save a business 322 kWh of energy per year, while switching a laptop off will save 76 kWh. Switching a 17-inch CRT monitor off will save the business 306 kWh, while to implement a 17-inch LCD monitor will save that business 168 kWh. Extra benefits described by MIT (n. d., p. 2, section 5 ¶ 2) include:

*"Reduced heat dissipation leading to reduced cooling energy
Extra battery time for laptops
Lower noise from reduced use of power supply and cooling
fans."*

Older ICT can have energy settings adjusted through bios which will make them run more energy efficiently. An example of this is to choose to turn off the computer as opposed to selecting sleep or standby mode.

The NZ Government (n.d.b) reports that the NZ Government invited manufacturers to form a partnership in order to produce equipment that operates more efficiently and labelled with the energy star ratings. To date partnerships have been formed with the following leading ICT manufacturers, Acer, Cannon, Dell, Epson, Fuji Xerox, Hewlett Packard, and Sharp.

Electrical retail outlet stores such as 100%, Bond and Bond and Noel Leemings are strong supporters of the Energy Star Ratings of electrical appliances. The Energy Star Ratings now include ICT devices as reported by Energy Star (2008).

Use Phase

Kalvar (2004, section 3 ¶ 3) suggests when the existing technology does not meet the required functionality; most ICT users start to consider replacing that ICT.

*"We need to spend X to get F functionality to create the
opportunity for Y profit."*

Or

*"We need to spend X money to bring F functionality to a
section of the company." Kalvar (2004, section 3 ¶ 4)*

At this time, all ICT users must realise their e-Responsibility and ensure the equipment currently used is disposed of in an eco-friendly manner (Kalvar, 2004).

Recycling

Williams (2004) recommends that recycling and upgrading ICT devices are viable options necessary in order to sustain the environment because of the high energy rates associated in the manufacturing process.

Govt³: Towards sustainable practice

The Ministry for the Environment (n. d.) has developed a website that is specific in identifying the steps needed, in order for NZ to sustain its resources. Sustainability involves environmental, social, and economical issues. The Ministry for the Environment (n. d.) defines the Core Government Principals with the Recommended Action for ICT and supporting office products as listed.

Core Government Principals	Recommended Action
Buy recycled	Prefer re-manufactured cartridges with a performance guarantee, or new cartridges containing post-consumer recycled content.
Maximise resource efficiency	Reduce your demand for printing, for example: Use electronic versions instead of paper copies. Set fonts and margins to improve efficiency of printing
Reduce waste to landfill	Send your used toner cartridges to a recycling programme. (Take-back systems are offered through the major office supply companies as well as some office equipment suppliers). Prefer packaging which has recycled content and is recyclable
<hr/> Other core principals <hr/>	
Energy efficiency	Choosing life cycle eco-labelled products and/or remanufactured or recycled content cartridges supports energy efficiency
Reduce toxics	Choosing life cycle eco-labelled products ensures that toxic components in toner and other ingredients is minimised

E-waste collection

E-Day (2007, p. 2) suggest the ultimate disposal of ICT equipment can be a problem for ICT users to consider. One dictionary definition of e-waste defined below as:

"Any discarded electronic or electrical devices or their parts; also called electronic waste." (Dictionary.com, 2009)

In order to discourage ICT users to dispose of this equipment in the local land-fills, local government and other organisations such as e-Day started to periodically provide a location known as a 'Collection Point' where an ICT user can bring along surplus ICT equipment for the express purpose of ridding themselves of it (e-Day, 2008b).

On October 4th, 2008, various organisations supporting the e-waste environmental cause, met, and formed an organisation now known as e-Day. The organisations that made up this group included:

"The Ministry of the Environment, Computer Access New Zealand (CANZ), Ministry of Education, 2020 Communications Trust, Divers, Remarkit, TES-AMM, Dell and Trade Me."
(e-Day, 2007, p. 3 ¶ 2)

E-Day is defined as a national 'Drive through E-waste Collection Strategy' that runs once a year. In 2008, thirty-two centres throughout NZ were organised so ICT users, businesses, and educational sectors could drive through to recycle old computers, computer parts, and cell phones (e-Day, 2008a). The national drive proved to be so successful that e-Day (2008a) reported how 946 tonnes of e-waste that has been successfully diverted away from local government landfills throughout NZ. The event was so successful that e-Day have organised another national day scheduled for September 12, 2009.

E-Waste collected on e-Day is gathered and finally sent overseas in ship containers to South Korea where the components are stripped down to be recycled.

"Copper wire and polymer coating, circuit boards and valuable metals such as copper, lead and zinc, unleaded glass and leaded glass which are separated, plastics steel and other metals" (e-Day, 2008d, Section 5, ¶ 1).

E-Day and their South Korean CRTNZ recycling partner have a Basel permit granted by the Basel Convention, for shipping e-waste to Korea to be dismantled (e-Day, 2008d).

Zero-Waste Trust and the CANZ Trust are examples of other organisations that provide a service where consumers can drop off redundant ICT. This ICT is then recycled back into the community for mainly educational purposes, either directly to schools or students (Zero Waste Trust, 2008a).

Other functions provided by the Zero-Waste-Trust on their website is a 'Buy it Back Guide', where a consumer can search for a product to check if the components have been recycled and what products come under these categories (Zero Waste Trust, 2008b).

Mac Gibbon and Zwimpfer (2006, pp. 14 -22) report companies such as Dell or Hewlett Packard now offer a 'Take-back' service where if a consumer buys from a particular company, when that product reaches its end-of-life, then that company will take the device back. In regards to the 'Trade-in' deal, consumers sell their older technology to the sales company and are expected to pay the difference in price for new ICT devices. These devices could be collected by a recycling business such as Remarkit who are Dells collection agency, and eventually end up in to Wellington. There may be a small fee charged for this service, in the range of \$10 - \$15.

It is interesting to note that monitors are stored and shipped to MRI Australia based in Melbourne and eventually converted to become eco-friendly devices. The authors Mac Gibbon and Zwimpfer, did not mention what happens to these monitors after the conversion process.

Possible re-use

Re-manufacturing ink-jet or laser cartridges

Working in conjunction with the Govt³: Towards sustainable practice policy, recycling now extends to ink and toner cartridge recycling and re-manufacturing options. Re-manufacturing is the process of replacing worn or broken parts of the ink or toner cartridge in order that the original cartridge can be re-used (Ministry for the Environment, n. d.).

These services are available to ICT users through organisations such as the Toner Recycler Centre and Cannon who have formed a Toner recycling program. Their goal is to either refill, re-manufacture ink-jet, or laser cartridges by draining all remaining ink from used cartridges to fill another cartridge (Cannon, 2009).

To reduce the overall volume of ICT sold in NZ, ICT users are being encouraged to upgrade or re-use used ICT as a viable option against purchasing new equipment (e-Day, 2008c).

Reduce e-waste by re-using or recycling ICT

To avoid creating e-waste, consumers are encouraged to recycle used ICT technology (Mac Gibbon & Zwimpfer, 2006, p. 11).

Re-use comes under the heading of recycling. One way an ICT user can dispose of ICT devices they no longer want or need is to sell it. Computer and computer components can be listed for sale in newspapers and are now regularly offered for sale on the web-auction site Trademe (Mac Gibbon & Zwimpfer, 2006, p. 17; Trademe, 2009a).

Companies such as Computer Recyclers based in Tauranga, and ARK Recyclers based in Auckland, use computers given to them to build computers that are re-built from recycled parts given to them. The re-built computers will be distributed to charitable organisations or people needing the technology (Computer recyclers, n. d.).

2.4: ICT and e-Responsibility

Another emerging buzzword is e-Responsibility. Industry expectations are such that all ICT product owners, not withstanding manufacturers or ICT users, automatically must take on e-Responsibility. One example of how manufacturers are e-Responsible is where companies such as Dell Computers and Hewlett Packard promote their sales efforts with offers of “Take back” or “Trade in” offers for used devices. The collection of used devices may incur a charge as previously reported by Mac Gibbon and Zwimpfer (2006, p. 11).

For computers traded in as reported by Mac Gibbon and Zwimpfer (2006, p. 31) Hewlett Packard exports these devices overseas to a HP recycling partner. Dell recycles in New Zealand through a partnership arrangement that recycles computer boxes for the local market and stores monitors for export to Australia, while IBM also works with a local partner where they crush and shred computer boxes and monitors. The steel is then collected while all other components are disposed of in landfills.

Another example of e-Responsibility is either recycling or re-manufacturing specific parts of ICT and disposing of the un-recyclable parts following local government environmental guidelines, or placing these parts into a community ICT collection centre.

2.5: Consequences of E-waste on the environment

"Lead pollution has been called the most wide-spread environmental health hazard in America."

(Lambert, Pierzynski, Erickson & Schnoor, 1997, Introduction ¶ 2)

Mac Gibbon and Zwimpfer (2006, p. 11) suggest disposing of e-waste is difficult for the average New Zealander, as not knowing exactly where or how to safely dispose of e-waste has created the situation where it is estimated that New Zealanders are storing 250,000 redundant computers in their homes (e-Day, 2007, p. 2).

In order to provide consumers with the means to dispose of e-waste, some local government bodies such as the Tauranga District Council have set aside a specific area in their Transfer Station where consumers can place this redundant equipment.

ICT equipment is manufactured with hazardous substances that include the metal components – lead and solder arsenic used in the older CRT monitors, selenium in power supplies, poly-brominated biphenyls added to plastics, cadmium used in semi-conductors, chromium used as corrosion protection in steel components. Cobalt is added to give strength to steel structures and provide magnetivity in the steel components, and mercury is used in switches and housing as reported by Russell (2008, p. 20).

Russell (2008, p. 20) reports that some of the materials used in the manufacture of ICT components are known to be of a toxic nature, the ultimate disposal of these products becomes a logistical nightmare for those responsible for protecting our environment against toxic contamination. Lambert et al. (1997) states that lead is known to be highly toxic to organisms, while cadmium is toxic to plants and animals. Leeching of toxic substances firstly into the soil, then finally into the waterways and underground water tables or through open drains creates the contamination.

2.5.1: Basel Convention – Hazardous waste and e-Waste

Mac Gibbon and Zwimpfer (2006, p. 7) defines the Basel Convention as a treaty that was signed by various developed countries in an agreement in 1989 originally for the purpose of governing the global movement of hazardous waste, but now also includes the global movement of e-waste (Basel Convention, n. d.).

As NZ is part of the Basel Convention the requirements are that, an ICT exporter needs to purchase a permit before they are able to export e-waste to other countries, and in particular to third-world countries. Mac Gibbon and Zwimpfer (2006, p. 7) suggest that some NZ exporters are exporting without the required permits and that the NZ Ministry of Economic Development (2007) who communicate with the Basel Convention, need to address this issue now rather than later.

The Basel Convention must place stringent controls on the movement of e-waste, before the actual tonnage of exported e-waste gets out-of-hand (Based Convention, n. d). All this will do is to re-locate an existing problem to the third-world countries.

Recycled ICT devices and specific individual components such as Cathode Ray Tubes (CRT) are required under the Basel Convention regulations, to be disposed of in special containers. ICT users have the option to use these collection point facilities if they so chose (Mac Gibbon & Zwimpfer, 2006, pp. 7- 8). In the CANZ report published in July 2006, the authors, Mac Gibbon and Zwimpfer specify that NZ has over 16 million individual electronic devices (p. 10). Each device is categorised as either a box or a monitor. The CANZ report also determines that the majority of those monitors are CRT monitors.

Energy Star (n. d.) suggests that although manufacturers and ICT users alike know that CRT monitors consume large amounts of electricity to run, least of all the amount of space a large CRT monitor takes up on a computer desk, has not yet seen the demise of the CRT monitor. CRT monitor manufacture and sales continue today.

Mac Gibbon and Zwimpfer (2006, p. 10, ¶1) have such high concerns in regards to the continued use of CRT monitors because:

"CRTs have been described as 'toxic time-bombs' and many are now entering our landfills."

Zero Waste Trust (2009) confirms that most of NZ e-waste will eventually end-up in local landfills.

2.6: Carbon emissions (CO₂)

2.6.1: NZ Government and the Kyoto Protocol

Such is the NZ Government commitment to environmental issues that Reuters, (2008, p. 31) reports the NZ Government have formed allegiances with a total of 36 developed nations, plus the European Union (EU) in order to protect the environment locally and on a global scale, with the formation of the Kyoto Protocol. A brief definition of the Kyoto Protocol is below:

"The Kyoto Protocol demands a formally signed commitment from each of its members in how they intend to reduce worldwide carbon emissions (CO₂). The recommendation is reduce the CO₂ down by 5 percent below recorded 1990 levels between the years 2008 – 2012"(Reuters, 2008, p. 17).

2.6.2: ICT manufacturing and greenhouse gases

It became apparent after completing the SME interviews that this size of business are both not aware of, as well as unconcerned in regards to ICT usage as being responsible for 2 percent of the earth's greenhouse gas emissions (Pettey, 2007).

The ICT industry falls under the industrial category and produces greenhouse gases in large quantities.

ICT consumers are well aware of the most commonly reported greenhouse gas, which is CO₂. However, ANI (2008) and ANI (2009) report that scientists have only recently been able to analyse and calculate the impact of another two potent greenhouse gases, that are growing in the earth's atmosphere at increasing rates of up to 11 percent per year. Ray Weiss (cited in ANI, 2008) from the Scripps Institute of Oceanography in the USA, conducted research in 2008 and the results of the research calculated there was 5,400 metric tons of Nitrogen trifluoride (NF₃), and Sulfuryl fluoride (SO₂F₂) in earth's atmosphere. Circuit boards in LCD monitors, thin-film solar cells, and microcircuits all use NF₃ in the manufacturing process. New research indicates that NF₃ is 17, 000 times more potent than CO₂ and will last in the earth's atmosphere five times longer than CO₂. SO₂F₂ the second of the potent gases lets of toxic fumes and is now a replacement for methyl bromide, (ANI, 2008; ANI, 2009).

ANI (2008) reports that current research carried out in the USA indicates that other gases combined with CO₂ contribute towards global warming. In 1997 when the NZ Government signed the Kyoto Protocol, the two gases NF₃ and SO₂F₂ although identified were not considered to be an element contributing towards global warming. As such, manufacturing guidelines for the products produced and the subsequent disposal of these end-of-life products that contain NF₃ and SO₂F₂ were not included in the Kyoto Protocol. Therefore at present any of the countries that signed the Kyoto Protocol in 1997, are not bound to protect our environment from these gases.

As such, the industry sector working in conjunction with the power and automobile sectors, have realised that in order to protect our environment against further damage caused by the release of CO₂ emissions into the atmosphere, they are developing a technology known as Carbon capture and storage (CCS). CCS reduces the amount of CO₂ released into the earth's atmosphere (Technology Showcase, 2008).

2.6.3: SME ICT usage and greenhouse gases

The definition of a SME based in NZ is classified by the Ministry of Economic Development (n. d.), as 19 or fewer people employed in business activities.

The NZ Government DS doc encourages SME's to implement an ICT working environment. There will be very few SME's within NZ, which do not use some form of ICT in their daily functionality. Computer usage provides a SME with the opportunity of using a networked printer / scanner or photocopier type device. Either the SME's can use the Public Switched Telephone Network (PSTN) landline telephone connection or there is the Naked Digital Subscriber Line (DSL) option available in order for that business to connect to the internet (Roos, 2009). Most SME's connect to the PSTN service so that their customers can communicate with them using a local call that is free of charge, for those customers whom use landlines themselves, rather than contend with communication via a mobile phone (Web stereo, 2009; Statistics NZ, 2006, p.18).

These points are confirmed by results taken from the Information and Communication Technology 2006 report, compiled by Statistics NZ (2006, p. 18, Section 2 ¶1) where the analysed results suggest:

"In the 2006 financial year, 93 percent of businesses used computers, and 91 percent used the Internet and 46 percent of staff had access to the internet."

Statistics NZ (2006, p. 29) research indicates that SME's provide 33 % of their employees with the use of mobile telephones.

The NZ Government recognises that SME's contribute small amounts towards the global carbon emissions when using electrical equipment use or by using fuel either for cooking purposes, or by the use of motorised transport (Ministry for Economic Development, 2009).

2.6.4: Carbon Credits in conjunction with NZ SME

As NZ SME's contribute little in the way of carbon emissions, the Carbon Emissions Trading Scheme does not automatically extend to this group of businesses; although some may meet the necessary criteria (Ministry for Economic Development, 2009).

"Brown-Santirso and Fu (2008. p. 2 ¶ 3) report the use of the Annual Enterprise Survey (AES) unit record data to directly compare the intermediate consumption values for each enterprise against costs of carbon emissions at several carbon price scenarios (\$15, \$25, \$50 and \$100 dollars per tonne) for those business deemed to output large volumes of carbon emissions".

Fortunately, for SME's unless otherwise identified as a business that outputs large volumes of waste, the Ministry of Economic Development (2009) suggests that SME's will feel the effect of this scheme in other ways. For example, the rising costs of fuel and electricity.

2.7: ICT and Energy types

At present three main forms of energy, operate ICT devices. These energies are identified as:

2.7.1: Electrical energy

The autumn and early winter months of 2008 saw the NZ electricity consumers strongly encouraged by Transpower (the combined group of electricity companies in NZ) using intensive media advertising, to conserve electricity energy. The reason behind this move was to make the NZ electrical consumers aware of the possibility that NZ may experience electricity shortages, because the continuing drought conditions were the cause of low water levels reported to be in our hydro-electric lakes (Transpower, 2008).

ICT devices have high-energy requirements that they need to use in order to operate (Williams, 2004, pp. 6166-74).

Energy Efficiency and Conservation Authority (cited in Level, 2009, Section ¶7) suggests that

"It is estimated that in New Zealand standby power, accounts for 5 per cent of the total household electricity use or \$100 million per annum."

Electricity usage and Standby mode

Current studies have shown that standby mode still consumes a high level of energy. Harrington et al. (2007, p. 1) and the Energy Efficiency and Conservation Authority (cited in Level, 2009) both suggest using electrical appliances in standby mode has a direct link to higher usage of electricity both in our homes as well in the work place. Standby mode is not limited to household devices and ICT devices such as security systems, computers, monitors, printers, portable phone stands and mobile telephone chargers operate in standby mode:

TVNZ Breakfast show guest Ben Gracewood refers to Standby power as "power vampires" and he suggests that electronic devices using standby power waste 10 percent of power (TVNZ, 2009a).

Consumers now have the option to select the most electricity energy efficient appliances on the market. Various companies provide energy savings tips on their company websites as provided by Trustpower (Trustpower, 2009). Energy Star reports that each new energy efficient appliance based on the annual energy output is awarded an energy star rating. The energy star label, which shows the annual kilo-wattage (kW), is now displayed on that device. The label includes a star chart that gives a quick visual reference to the product energy rating, much like reading a simple graphical image (Energy Star, 2008).

2.7.2: Un-interrupted power source (UPS / battery power)

It is good practice that when working with ICT either at home or in the workplace, to plug all ICT devices into a surge protector, in order that your devices are less likely to burnout as the result of a power surge (The Free Dictionary, 2009b).

Business consumers have to protect company data as well as the ICT itself. An UPS provides a limited time power supply that provides energy to devices that need to be used, during electrical down times. Consumers using laptop computers can remain operational as these devices are dual powered by both an UPS battery, as well as by DC using an adaptor. UPS provides a powerful alternative energy source in an emergency, as systems running on limited functionality switch over onto the UPS system (Answers.com, 2009).

2.7.3: Solar energy

Current ICT energy supplies have been restricted to electricity connections or an uninterrupted power supply (UPS battery power supply) but emerging technology is about to change how ICT devices can be recharged as defined below.

Emerging technologies for ICT devices

ICT energy supplies are evolving with the news of the release of a solar powered backpack in April 2008 by a NZ businessperson Paul Hill part owner of the company Chinzacorp. Initially developed as an emergency kit, the backpack comes with a computer and provides telecommunications technologies and access to the internet. These backpacks are powerful enough to assist with power output and resource conservation as they are powered by solar panels (Jackson, 2008).

TVNZ Breakfast show reports about a solar generator bag, which is supposed to charge ICT devices that range from the size of a mobile phone to a laptop computer (TVNZ, 2009a).

2.8: Chapter summary

The NZ Government is consciously aware of the need for people within NZ to maximise the benefits that are available to them using ICT and the internet. In order to fulfil promises made to constituents, the NZ Government has developed a Digital Strategy. The belief is that the DS doc will provide the opportunities for all New Zealanders to gain computer literacy by providing the necessary resources such as computer centres so that New Zealanders can access both learning manuals and computers. Recently, New Zealand Prime Minister John Keys specified the need for the NZ Government to spend 1.5 billion dollars on upgrading the telecommunication services so that all New Zealanders will have access to fast broadband.

2.8.1: What are the main criteria when purchasing ICT?

Functionality

The number one criterion for purchasing ICT is it must perform the required function, because it is a working tool that is expected to return a profit as quickly as possible. Therefore, Respondents generally purchase ICT to support existing business activities, or to implement new activities, unless existing ICT malfunctions and this is the reason behind the replacement. The figures for ICT sales showed an increase of 3 percent growth for 2008.

Cost

The second most important criterion is cost. SME's will purchase ICT that provides the required functionality for the best price.

2.8.2: Are SME's concerned about 'Green' ICT issues

CO₂ emissions

Green issues such as CO₂ emissions produced through the manufacturing process and ICT use are discussed in this chapter. Literature specifies that SME in most instances cannot be responsible for the output of CO₂ emissions and NZ are working in conjunction with the Kyoto protocol to reduce CO₂ emissions by 5 percent by year 2012.

Hoarding ICT rather than land-filling it

ICT recycling is a hot topic with literature confirming that NZ ICT users find disposing of older ICT such an issue, that large numbers of these devices are never disposed of as either the ICT user does not know where to dispose of these devices, or has concerns about wiping data off the hard-drives.

ICT manufacturing

ICT manufacturers such as Dell and IBM offer ICT users a Take-Back or Trade-In option for older technology, in order to sell new technology. Once collected the older ICT is delivered to recycling partners, who wholly or partially dismantle these devices for specific reasons. The devices particularly CRT monitors are then shipped overseas, where they are completely dismantled and the empty shells are shredded and sent to a local landfill.

ICT Energy use and conservation

CRT monitors are known to use high amounts of energy in order to function. LCD monitors use less energy. New ICT devices are required by law to be energy efficient and must be graded by the energy star labelling system. Once graded, the device will display the energy star label where ICT users can include energy use in any ICT purchasing decisions simply by reading the energy star label of each device.

ICT devices using Standby power consume an additional 10 percent of electricity.

Emerging solar powered packs for ICT are making an appearance.

2.8.3: What do SME's know about recycling?

Buy recycled

The Gov³ policy promotes ICT users buy recycled ICT.

Ink cartridge recycling

To reduce printing documents by creating electronic documents, and to send used toner cartridges to a refilling station to be recycled. Ink cartridges are refilled, and sold on. If a cartridge is damaged, then it will be repaired using another used cartridge part.

Hazardous waste – e-waste

Literature confirms that ICT users are aware that disposing of ICT, particularly CRT monitors in a landfill is a major cause of environmental damage created by the leeching of toxins into the ground, which eventually filters through into the water table and open streams and rivers. This is one reason why the ICT user does not dispose of these devices. Computer recyclers based in Tauranga, recycle older ICT that may include re-building it for re-sale. The Tauranga Transfer Station has set aside a specific area where white-ware and ICT can be dropped-off free-of-charge to be recycled.

Export e-waste

Organisations such as e-Day hold e-waste collection days where an ICT user can drive through and drop-off surplus ICT. These devices are collected and sent overseas to be further dismantled. E-Day holds a Basel convention permit for any e-waste that they send to third-world countries.

Chapter Three

3: Methodology and research methods

3.1: Introduction

This chapter focuses on the choices of methodology used and subsequent research methods that delivered these results.

In this chapter, we will complete an in-depth examination of the various stages involved in the research design that will include selecting the sample, determining which methodology will deliver the best results, the process of data collection and finally data analysis.

Once the methodology was selected, decisions were made about what types of questions should be included in the research instrument (questionnaire). Apart from using the basic demographic data, the questionnaire design specifically included environmental questions for these reasons.

- To ascertain the knowledge that Respondents have in regards to current environmental issues
- Gather each Respondents thoughts and opinions about the subject
- Determine the level of computer knowledge each Respondent had.

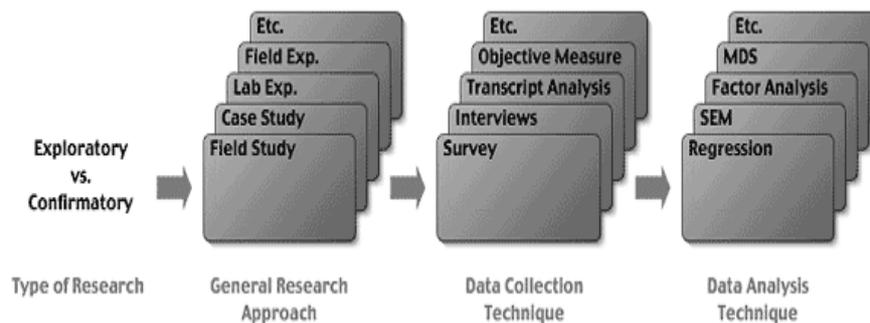
An overview of the researcher's procedures for the storage of confidential data, the dispersal, and disposal of all confidential material, and disclosure of the results are in this chapter.

3.2: Methodology

Figure 3 defines some of the processes the researcher can use to build up their personal research design.

Figure 3: Processes behind the research design

(AIS, n.d)



Myers (1997, pp. 241–242, Section 8 ¶ 1) suggests that

"The choice of research method influences the way in which the researcher collects data. Specific research methods also imply different skills, assumptions, and research practices."

3.3: A multiple case study, using the case study research strategy

Referring to Figure 3, the general research approach for this research project is Case Study Research. For the purposes of this research, Zach (2006, p. 2, Section 2 ¶ 1) defines 'a case study' as:

"an exploration of a 'bounded system'... a program, an event, an activity, or individuals"

Kuhlthau (as cited in Zach, 2006, p. 8) suggests that the use of the case study will give the researcher a tool to develop a deeper perception of the quantitative data and as such thoroughly recommends that researchers use the mixed method approach and theory triangulation.

Of the recognised research strategies, the selected option was developing a multiple case study from the sample of nine NZ SME's that were interviewed (Zach, 2006, p. 2). Saunders, Lewis and Thornhill (2009, pp. 108-111) defined the other six research strategies that include Archival research, Grounded theory research, Ethnography, Action Research, Survey and Experiment but Zach (2006, p. 2) is adamant these six research strategies were not able to bring out the true feelings of the Respondents based on the small numbers interviewed.

Yin (as cited in Zach, 2006, p. 9) recommends that between six to ten cases are required in order to build a multiple case study. Zach (2006, p. 9) describes how multiple case study design is developed by asking each individual case study (in this case the Respondent from each SME) to answer the same set of questions and comparing each answer of each Respondent against each of the other Respondents. Zach (2006, p. 9) discusses the two stages involved. Stage one is the Literal replication stage where the researcher sets out to gain similar information (if possible) while stage two is the theoretical replication stage. Here the researcher is working to either prove or disprove any patterns that may have developed during the Literal replication stage.

3.4: The time-horizon using the mixed method choice

This research is a one-off 'snap shot in time'. The researcher refers to the one off data gathering activity involved with completing nine interviews and transcribing the digital data onto individual questionnaires in October 2008. At that point-in-time, the data collected was true to how each of the Respondents personally felt and what they believed in.

To complete this research the researcher employed the mixed method approach, which uses parts of both quantitative and qualitative research data collection and data analysis methods.

3.4.1: Quantitative method

In reference to Figure 3, the quantitative method data collection technique used is the research instrument, as discussed by AIS (2009). AIS (2009) describes how the research instrument will now become the experimental instrument as the researcher gathered the data directly from the Respondents, rather than from the more commonly associated form of data transfer which could be either from mailed or electronically transferred documents.

Data collection method – The Experimental Instrument

Referring to Figure 3, the experimental instrument or questionnaire form (Appendix A) consists of six sections, which contain a total number of 43 questions. The respondent was encouraged to add comments over a variety of issues, into individual comment boxes throughout the questionnaire. The questionnaire provided the basis for each interview. A description of what each of the six parts of the questionnaire contained is below:

Part 1: consisted of ten closed questions

Part 2: consisted of seven closed questions, and two open questions

Part 3: consisted of three closed questions, and two open questions

Part 4: consisted of five closed questions, and twelve open questions

Part 5: consisted of three closed question, and two open questions

Part 6: consisted of four closed questions, and three open questions

The questions were built-up from closed demographic questions leading towards both open and closed questions designed to collect the necessary data needed for the secondary purpose of this research. The idea behind this the use of this format was to build up a SME profile that would indicate; what resources each business possessed, how these resources were utilised, the level of knowledge the Respondent had in each specific topic area, and to gather valuable comments and opinions about the topics discussed in the questionnaire.

Microsoft Excel was the analysis tool used to complete the statistical data analysis. The researcher manually entered all data into the spreadsheets and calculated the formula, to produce the correct results.

3.4.2: Qualitative method

In reference to Figure 3, the type of research is the qualitative method, and the data source was the interview as defined by Myers (1997, pp. 241-242, Section 3 ¶ 3) also gives the following description for qualitative research methods.

"Qualitative research methods are designed to help researchers understand people and the social and cultural contexts within which they live."

Nine questionnaires contain a transcription of the completed interview, while the tenth respondent completed questionnaire number ten, who then mailed it onto this researcher. This respondent was running against time restraints due to annual leave.

Inductive research approach

Saunders et al. (2009, pp. 117-119) define the Inductive research approach as providing the foundation for the theory and suggest the steps include the eight following points.

- Identify the research query
- Form a research question
- Decide the best methodology to be used for gathering the required data
- What data instruments will be used to collect the data from firstly the primary sources and secondly from the literature
- How to organise, compare and finally analyse that data
- Discuss the findings
- Define the conclusions

Semiotics

Myers (1997, pp 241-242, Section 16 ¶ 2) provides one definition of Semiotics and an explanation on the modes of analysis as defined below:

"Semiotics is primarily concerned with the meaning of signs and symbols in language. The essential idea is that words/signs can be assigned to primary conceptual categories, and these categories represent important aspects of the theory to be tested. The importance of an idea is revealed in the frequency with which it appears in the text."

Modes of analysis - Discourse analysis (Content – Narrative data)

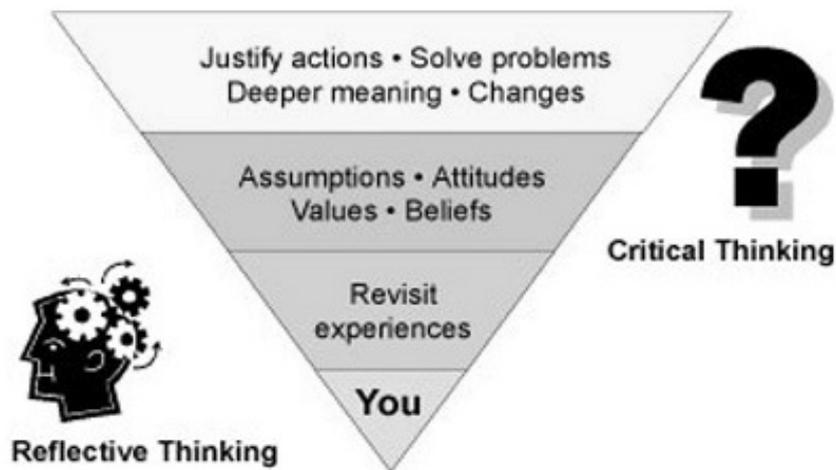
When working with Content analysis, the researcher is looking for similar data to form a particular pattern that will emerge from the narrative data, generated using open-ended questions and comments, or transcripts of interviews by the Respondents (Powell & Renner, 2003, p. 1). Emphasis is on the regularity of each of those patterns occurring in the data. It is the reoccurrence and consistency of those patterns that a researcher will base their supposition on and form opinions.

The researcher's reactions will pick up valuable data gathered from Respondents purely through talking with them, because generally speaking, people do express their opinions. The researcher's reactions will quickly tune in to firstly how interested the Respondent is in taking part in the interview, and secondly any particular interests / or lack of enthusiasm they may have in a specific topic. It is the reaction, that drives how the interview progresses and ultimately the amount of data that is generated.

Data analysis technique – Reflective and critical thinking

Figure 4: Reflective and critical thinking

UNSW (2009)



"Figure (4) shows that the reflective thinking process starts with you. Before we can begin to assess the words and ideas of others, you need to pause and identify and examine our own thoughts. Doing this involves revisiting our prior experience and knowledge of the topic you are exploring. It also involves considering how and why you think the way you do. The examination of your beliefs, values, attitudes and assumptions forms the foundation of your understanding. "

UNSW (2009, ¶1, 2)

Referring to Figure 4 and the four levels, reflective and critical thinking skills applied throughout the research design and used to ascertain the collection of the most relevant data was possible, through to the analysis of that data.

"Dewey (cited in Fisher, 2001, p. 2 ¶ 2) describes reflective thinking as a mixture of active, persistent, and careful consideration of a belief or supposed form of knowledge."

Data collection method

The search for and subsequent purchase of a digital Dictaphone to record each of the nine Respondents interviews words was under-taken. Before the start of each interview, the Respondents permission sought in order to record the interview, with an explanation to the Respondent that afterwards a transcription of the interview was to be completed. During the interview, each respondent was encouraged to discuss their thoughts and give their opinions.

Qualitative data was collected from a specifically designed questionnaire that was hand-delivered to either the owner / manager who passed this on to their IT personnel in the sample. The sample was made up from 10 previously selected SME's.

The collection of qualitative data was by way of the formal interview process with each of the questionnaire Respondents.

The case study research opened up the data sources and primary collection methods to include interviews and questionnaires, and takes into account the researcher's impressions and reactions. The impressions and reactions not only came from each individual questionnaire and formal interview, but could also be drawn from the responses to the questions and the willingness of the Respondents to give as much open and honest feedback as they felt comfortable doing within the allowed time limit of 40 minutes.

3.4.3: Triangulation

The researcher has collected data from ten different sources that cover a wide range of industry sectors that has returned similar data.

3.4.4: Storage of confidential material

The researcher decided not to ask pertinent personal or sensitive SME questions as she felt that type of data was not relevant to this research topic.

Each questionnaire is encoded, so that the details on that questionnaire are not obvious as to belong to a particular SME.

The raw data was kept on the Dictaphone with the batteries taken out of it until the data was uploaded onto the computer and burnt onto a compact disc (CD).

The SME details were stored in a separate document on this researcher's laptop computer

3.4.5: Dispersal and disposal of confidential material

A softcopy version of the questionnaire e-mailed to Unitec, and filed on a Unitec server. A hardcopy will be become an appendices to this thesis.

A copy of the original digital data-file of the interview will be e-mail to Unitec and filed on a Unitec server. The data-file is uploaded, and burnt onto CD for storage.

All hard copies of the questionnaire are to be kept for a period-of-time before being shredded.

3.4.6: Disclosure of findings

All findings and conclusions are now published in this thesis

Chapter Four

4: Findings

4.1: Introduction

The focus of Chapter 4 is reporting findings from the data gathered through several collection methods employed by the researcher. As such, the division of the data is into two distinct areas of analysis.

The first part will look at the quantitative data returned from the experimental instrument otherwise known as a questionnaire, collected from ten questionnaires (AIS, 2009).

The second part will look at the qualitative data generated from discussion held in independent interviews with each of nine Respondents.

The Respondent is the person that each New Zealand small medium-sized enterprise business owner / manager (SME) identified as being responsible for making ICT related decisions for that business. The data collected was from that Respondent. The SME's are within the Tauranga City area in NZ.

Demographic data will be analysed to gather the background information, which is necessary to ascertain the position of each SME and identify the gender of each Respondent in order to compare the knowledge and level of experience that each Respondent has in regards to ICT usage and leading onto specific environmental issues. The analysed and compiled data in the first part represents the actual data from the completed questionnaires, while the second part contains the transcript of each of the nine Respondents comments gathered from their interview.

The Respondent sample selection was limited to SME owners / managers / or their IT personnel. The researcher deliberately choose SME's that covered a broad section of industry sectors, in order that a true and deep understanding of the actual attitudes from varying social, economical and industry specific backgrounds could be attained and scrutinised thoroughly, before being analysed. The SME geographical locations were restricted to within the Tauranga City area and close suburbs, owing to transportation costs associated with gathering the required data. Each Respondent asked to take part in this research project fitted the selection criteria, as they employed between 1 to 19 staff that defines an SME, as specified by the Ministry of Economic Development (n. d.).

The SME who made up the sample used in this research project, are typical examples of their industry sector. They cover a cross section of industries as defined below:

- Animal health - food / services
- Animal related product sales
- Car and van sales
- Engineering - design
- Engineering – industrial manufacture / repairs
- Food – Bakery
- Grocery retail
- Furniture sales
- IT – sales, repairs, and implementation
- Motorcycle sales, parts sales, and motorcycle repairs

4.2: Demographics

4.2.1: Where is this business sited?

(Appendix A, Q. 1)

Chart 1: SME districts

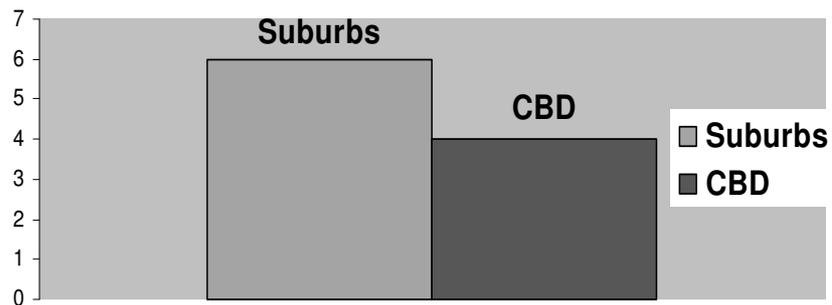


Chart 1 displays the results.

The results showed that six Respondents were in the suburbs while the remaining four Respondents indicated they were in the Central Business District (CBD).

4.2.2: What industry sector identifies your SME?

(Appendix A, Q. 2)

Table 1: The industry sectors

Industry sector	Respondents
Health	0
IT	0
Tourism	1
Hospitality	1
Retail	5
Other	3

Table 1 displays the results.

The results returned the following facts. None of the Respondents belonged in the Health or Tourism sectors. Five Respondents offer Retail services. One Respondent offers IT services and one Respondent offers Hospitality services. The last three Respondents categorised themselves as offering Other services. To define these further, one Respondent offers Veterinary services, one Respondent offers Consultant engineering services while the last Respondent offers Trade services.

4.2.3: What is your role in this business?

(Appendix A, Q. 3)

Table 2: Role in the business

Business Role	Respondents
Owner	8
Manager	1
Other	1

Table 2 displays the results.

The results showed that eight Respondents were the owners of the SME. One Respondent described himself or herself as the manager of Partnership owned SME's, while the remaining Respondent placed themselves into the Other category. The other is in this instance is the ICT representative.

4.2.4: What gender are you?

(Appendix A, Q. 4)

Chart 2: Gender of the SME ICT person

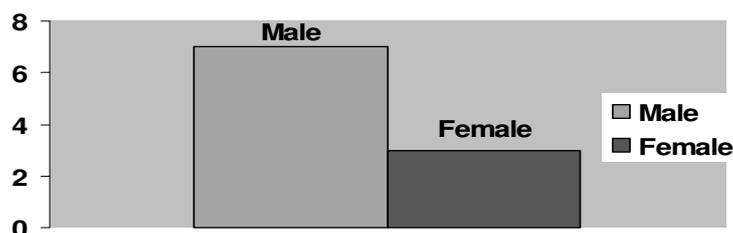


Chart 2 displays the results.

The results show that seven male Respondents work in Partnership owned and Sole trader SME's, while three Respondents are female who work in Partnership owned SME's.

4.2.5: How many staff are employed by your business?

(Appendix A, Q. 5)

Table 3: Number of staff employed

Staff	Biz Category	Respondents
Less than 2	Biz Cat. 1	4
2 to 5	Biz Cat. 2	2
6 to 10	Biz Cat. 3	1
11 to 15	Biz Cat. 4	3
16 to 19	Biz Cat. 5	0

The current staff levels of each of the Respondents used in this sample is displayed in Table 3. Table 3 displays the results.

Listed below are five business categories, based on the number of people who work in that business. The business categories operate as:

Business Category 1 (Biz Cat. 1): Those who responded were either a Sole Trader or Partnership (no employed staff)

Business Category 2 (Biz Cat. 2): If there are between 2 to 5 people employed, then this Respondent will working with staff in full-time or part-time positions

Business Category 3 (Biz Cat.3): If there are between 6 to 10 people employed, then this Respondent will be working with staff that work in full or part time positions

Business Category 4 (Biz Cat. 4): If there are between 11 to 15 people employed, then this Respondent working with up to 15 staff that work either in a full or part time positions

Business Category 5 (Biz Cat. 5): If there are up to 19 staff then this Respondent will be considered as the same as Biz Cat. 4.

The results show that three Respondents employ less that two staff. Another two Respondents employ between two and five staff. One Respondent employs between six to 10 staff, while three of the Respondents employ 11 to 15 staff. It was interesting to note that not one of the Respondents employs 16 to 19 staff.

4.2.6: What hours do staff work?

(Appendix A, Q. 6)

Staff employment categories

Listed below are the three Staff employment categories under which each Respondent can offer employment.

Staff Employment Category 1 (Staff Cat. 1) Employing full-time staff only

Staff Employment Category 2 (Staff Cat. 2) Employing full-time and part-time staff

Staff Employment Category 3 (Staff Cat. 3): Owner / manager operated businesses that use other assistants who come into the business to assist in business functions. These people may not necessarily receive salary or wages in return for their services. For example, they may be family members; school aged children or independent consultants who provide services for that SME.

The results show which business category the Respondents fall into, based on the number of staff as displayed in table 3.

Three Respondents interviewed fell under Biz Cat. 1 and Staff Cat. 3. The discovery of a common theme through the research showed those businesses operating as a Sole trader or a Partnership SME with the owner / manager working full-time, needed outside assistance from other people on a regular basis.

One Respondent falls under Biz Cat. 1 and Biz Cat. Three Respondents use Staff Cat. 2. Two Respondents fall under Biz Cat. 2 using Staff Cat. 2. Three Respondents fall under Biz Cat. 4 using Staff Cat. 2. Two Respondents fall under Biz Cat. 2 and Biz Cat. 4, as well as one of this Respondent group falls under Biz Cat 3 and each of the three Respondents use Staff Cat. 3.

Table 4: Staff employment categories

Hours worked	Respondents
Full-time	10
Part-time	7
Casual	1
Other	2

The results are in Table 4.

The results shown from the sample that each of the 10 Respondents has full-time staff. Seven Respondents employ part-time staff. One Respondent offered a casual position, while two Respondents used Other staff.

How many employees work full-time?

(Appendix A, Q. 6.1)

Table 5: Full-time staff

Full-time	Respondents
Less than 2	6
2 - 5	1
6 to 10	3

The results are in Table 5.

The results show 10 Respondents have full-time staff where six Respondents employee Less than 2 staff, 1 Respondent employees 2 to 5 staff, while three Respondents employee between 6 to 10 staff.

How many employees work part-time?

(Appendix A, Q. 6.2)

Table 6: Part-time staff

Part-time	Respondents
Less than 2	4
2 - 5	3
6 to 10	1

The results are in Table 6.

The results confirm that seven Respondents employ part-time staff. The breakdown is divided as follows: Four Respondents employee Less than 2 part-time staff. Three Respondents employ between 2 – 5 part-time staff, while one Respondent employs between 6 to 10 part-time staff.

How many employees work casually?

(Appendix A, Q. 6.3)

Table 7: Casual staff

Casually	Respondents
Less than 2	0
2 - 5	1
6 to 10	0

The results are in Table 7.

The results confirm that only one Respondent employs casual staff.

How many assistants come under the other?

(Appendix A, Q. 6.4)

Table 8: Other assistants

Other	Respondents
No other assistants	6
Less than 2	3
2 - 5	1
6 to 10	0

The results are in Table 8.

The results confirm that four Respondents use Other assistants. The breakdown is as follows: Three Respondents use Less than 2, while one Respondent uses between 2 to 5 other assistants. Not one of the Respondents uses 6 to 10 other assistants. These assistants do not come under the staff category as these assistants help on an 'as needed' basis.

Who are the others?

(Appendix A, Q. 6.5)

A description of other assistants is provided below in Table 9

Table 9: The Other categories of assistants

Who are the Others?	Respondents
Family	1
Family who is IT	2
IT	1
Co-owner	2
Outside Consultants	1
Neighbours	1
Family business consultant	1
No other assistants	1

Table 9 displays the results.

The results show that eight Respondents use other assistants whom offer a range of different skill sets. One Respondent uses family members, two Respondents use family members who also act as their IT person. One Respondent place their IT person into this category. Two Respondents call for the co-owner to fill in if necessary. One Respondent uses outside consultancy services. One Respondent uses a neighbouring SME to keep an eye on their business if necessary while one Respondent uses a family member whose speciality is in the advertising and marketing fields.

4.3: ICT demographics

4.3.1: Does your SME use ICT in every day business practices?

(Appendix A, Q. 7)

Table 10: Daily use of ICT by SME's

Options	Respondents
Yes	10
No	0

Table 10 displays the results.

The results show that 10 Respondents interviewed use ICT in their everyday business functionality.

4.3.2: Please explain why this SME does not use ICT?

(Appendix A, Q. 8)

Table 11: No daily use of ICT

Options	Respondents
Yes	10
No	0

Table 11 displays the results.

The results show that this question is non-applicable to this sample of Respondents, as each of the 10 Respondents interviewed used ICT in their every-day business practices.

4.3.3: What ICT is available to be used by the staff on a daily basis?

Computer

(Appendix A, Q. 9, 9.1)

Table 12: Computers used daily

Computers	Respondents
Desktop PC	9
No Desktop PC	1
Laptop computer	6
Thin client	1
Blackberry	1
Server	5

Table 12 displays the results.

The results specify that nine Respondents use desktop PC's, while one Respondent does not own a desktop PC.

Six Respondents have also implemented laptop computers. Five Respondents have implemented Server technology, while one Respondent has implemented one each of both thin client and blackberry technologies as defined in Table 12.

Network

(Appendix A, Q. 9, 9.2)

Table 13: SME's use of LAN

Network	Respondents
LAN	6
Wireless	4
Ethernet	5
Combination of above	3
Intranet	3
Switch	1
Router	4
ADSL modem	10

Table 13 displays the results.

The results confirm that six Respondents have implemented a Local Area Network (LAN) environment. Four of this group of Respondents use wireless LAN technology, while five Respondents use an Ethernet LAN environment. Of the LAN users, three Respondents use a combination of both the Ethernet and wireless LAN technology.

Our Respondents have implemented other network technologies for example, three Respondents have implemented a company intranet. One Respondent has implemented a switch device to connect their Ethernet LAN, while four Respondents use a router to connect their Ethernet LAN.

Each of the 10 Respondents has implemented an Asymmetric Digital Subscriber Line (ADSL) modem for a fast speed broadband internet connection.

Telephone system

(Appendix A, Q. 9, 9.3)

Table 14: ICT used daily in by SME's

Telephone system	Respondents
Landline telephone	10
Cell-phone	10
Facsimile / photocopier / printer	10
Fast broadband	10
VoIP	2

Table 14 displays the results.

The results show that each of the 10 Respondents uses ICT's, such as a landline telephone and a cell phone for business purposes.

Each of the 10 Respondents uses office ICT devices such as a facsimile, photocopier, or printer.

Each of the 10 Respondents have a fast broadband connection in order to connect to the internet.

Two Respondents have implemented VoIP in the form of Skype software. This is in order to communicate with other family members over business matters. Skype offers face-to-face communication in real-time.

4.3.4: How many computers would be used on a daily basis?

(Appendix A, Q. 10)

The results explain how many actual machines each business operates. Respondent 1 operates two desktop PC's in the store. The one thin client device is setup in the office as is laptop computer and blackberry device that the Respondent uses as well as the server. The total is six devices.

Respondent 2 operates one desktop PC in the office and the laptop computer at home for after-hours. The total is two devices.

Respondent 3 operates one laptop computer. The total is one device.

Respondent 4 operates one desktop PC. The total is one device.

Respondent 5 operates one desktop PC and their laptop computer as well as a server. The total is three devices.

Respondent 6 operates two desktop PC's and a server. The total is three devices.

Respondent 7 operates five desktop PC's and a server. The total is six devices.

Respondent 8 operates four desktop PC's and two laptop computers. The total is six devices.

Respondent 9 operates four desktop PC's and one laptop computer, as well as a server. The total is six devices.

Respondent 10 operates one desktop PC.

Summary: This total does not take into account any of the devices used privately. Between each of our ten Respondents that formed the sample used in this research, the total number of IT devices used on a daily basis is 21 Desktop PCs, seven laptop computers, one thin client, one Blackberry device and five servers which brings the total to 35 devices.

Table 15 displays the results.

Table 15: Number of computers used daily

Respondent	Desktop PC	Laptop	Thin client	Blackberry	Server	Total of IT used in each business
1	2	1	1	1	1	6
2	1	1				2
3		1				1
4	1					1
5	1	1			1	3
6	2				1	3
7	5				1	6
8	4	2				6
9	4	1			1	6
10	1					1
Total number of IT devices						35

4.3.5: How many hours per day is each computer switched on for?

(Appendix A, Q. 11)

Table 16: Hours per day desktop PCs are on

Desktop PC and thin client turned on	Respondents
1	0
2 to 3	0
4 to 5	0
6 to 8	1
Greater than 8	6
Permanently	3

Tables 16, 17 and 18 display the results.

The results show that with the desktop PC's and thin client technology, none of the Respondents use their computer for 1 hour, none of the Respondents use their computer for 2 to 3 hours, none of the Respondents use their computer for 4 to 5 hours each working day. One Respondent uses their computers for 6 to 8 hours each working day. Six Respondents use their computers for greater than 8 hours, while three Respondents leave their computers on permanently.

Table 17: Hours per day Laptops are on

Laptops and Blackberry turned on	Respondents
1	2
2 to 3	0
4 to 5	0
6 to 8	0
Greater than 8	4
Permanently	0

In regards to the use of laptop and Blackberry computers, the results show that two Respondents use their laptop computer for 1 hour, none of the Respondents uses their laptop computer for 2 to 3 hours, and none of the Respondents uses their laptop computer for 4 to 5 hours. None of the Respondents uses their laptop computer for 6 to 8 hours each working day. Four Respondents use their laptop computer for greater than 8 hours, while none of the Respondents leaves their laptop computer on permanently.

Table 18: Hours per day Servers are on

Hours Servers turned on for	Respondents
1	0
2 to 3	0
4 to 5	0
6 to 8	0
Greater than 8	0
Permanently	5

The results show that five Respondents that run server technology leave their servers on permanently.

4.4: IT Section

4.4.1: Do you need to consult with an IT professional to upgrade ICT?

(Appendix A, Q. 12)

Table 19: Use of ICT professionals

Options	Respondents
Use ICT professional services	7
Don't use ICT professional services	3

Table 19 displays the results.

The results show that seven Respondents have a need to use ICT professional services whereas three Respondents feel they have enough knowledge that they do not need to use ICT professional services.

4.4.2: Who is responsible making purchasing and disposing of ICT?

(Appendix A, Q. 13)

Table 20: Responsible for ICT decisions

Purchase / dispose of IT	Respondents
Owner	1
Manager	2
IT	2
Other	1
Owner / IT	2

Table 20 displays the results.

The results show that five Respondents are the SME owner and they make all the ICT decisions in regards to purchase or disposal of ICT technology. Two Respondents indicate they manage the SME and are therefore responsible for making ICT decisions. Two Respondents suggest that while they own their SME, they work in conjunction with their IT personnel in regards to ICT purchase and disposal. One Respondent suggests that although they make all IT recommendations, ultimately it is the owner who makes the final decision.

4.4.3: What knowledge and level of experience of ICT?

(Appendix A, Q. 14)

Table 21: Knowledge and experience

Knowledge and level of ICT	Respondents
Expert	0
Above average	4
Average	5
Below average	1
None	0

Table 21 displays the results.

The results indicate that although each of the 10 Respondents has ICT experience; none of the Respondents selected the expert option. Four Respondents selected the Above Average option, five Respondents selected the Average option, one Respondent selected the Below average option, while none of the Respondents indicated they have no ICT experience.

4.4.4: How did you gain this knowledge and experience?

(Appendix A, Q. 15)

Table 22: How Respondents gained their computer skills

Respondent	Other	Self-taught	Work experience	Tertiary qualification
1	√	√		√
2		√	√	
3		√		

4		√		
5	√	√	√	√
6	√			
7		√	√	
8	√	√	√	
9		√		
10		√		

Table 22 displays the results.

The results are indicative of how each Respondent gained their computer skills. Respondent 1 selected three of the four options available on the questionnaire, the options selected included a Tertiary qualification coupled with Work experience and being Self-taught. The Self-taught was by conducting personal research.

Respondent 2 selected two of the four options available on the questionnaire, the options selected included Work experience, and being Self-taught.

Respondent 3 selected only the one option from the four options available on the questionnaire, the option selected was being Self-taught.

Respondent 4 selected only the one of the four options available on the questionnaire, the option selected was being Self-taught.

Respondent 5 selected all four of the available options on the questionnaire, included was a Tertiary education, Work experience, Self-taught and Other. To compliment their computer skills they have continued to up-skill their computer skills through various computer means including attaining excel spreadsheet skills that were available through the Bay of Plenty Polytechnic and the basic word processing skill of learning how to type.

Respondent 6 selected only one of the four options available on the questionnaire, the option selected was Other. Their comment for this was they had considered themselves a Self-taught hacker.

Respondent 7 selected two of the four options available on the questionnaire, the two options selected included Work experience, and being Self-taught.

Respondent 8 selected three of the four options available on the questionnaire, the three options selected included Work experience, Self-taught and Other. The comment here is that they used to buy and dismantle equipment and then rebuild it.

Respondent 9 selected only one of the four options available on the questionnaire, this option was Self-taught.

Respondent 10 selected only one of the four options available on the questionnaire, this option was being Self-taught.

4.4.5: How many years experience do you have?

(Appendix A, Q. 16)

Table 23: Years of ICT experience

Years experience using ICT	Respondents
0 to 2	0
3 to 5	0
6 to 10	5
Greater than 10	5

Table 23 displays the results.

The results give a general indication of how long our Respondents have been using computers. None of the Respondents has between 0 to 2 years computer experience. None of the Respondents has between 3 to 5 years computer experience. Five Respondents fall into the category of having six to ten years computer experience, while five Respondents fall into the category of having more than ten years computer experience.

4.5: Purchasing ICT

4.5.1: On an average how often do you upgrade your ICT?

(Appendix A, Q. 17)

Table 24: ICT upgrades

Upgrade ICT	Respondents
Yearly	1
Two yearly	0
Three yearly	0
As required	9

Table 24 displays the results.

The results state how often the Respondents upgrade their ICT. One Respondent specifically upgrades ICT annually, while the remaining nine Respondents suggest they upgrade ICT As required. None of the Respondents upgrade ICT two or three yearly.

4.5.2: What is your personal attitude towards sustaining “Green” ICT?

(Appendix A, Q. 18)

Table 25: Personal attitudes ‘Green’ ICT

Personal attitude	Respondents
Strongly agree	3
Agree	5
Don’t agree	0
Other	2

Table 25 displays the results.

The results showed a positive reaction towards sustaining a ‘Green’ environment from each of the Respondents. Three Respondents all Strongly agree that they would like to sustain a Green ICT environment. Five Respondents all Agree with the thought of sustaining a Green ICT environment, while none of the Respondents selected the Don’t agree. Two Respondents selected the Other option discussed in Chapter 5.

4.5.3: How important is it to your business to be eco- friendly?

(Appendix A, Q. 19)

Table 26: Be an eco-friendly business

Be eco-friendly	Respondents
Extremely	1
Very important	2
Important	6
Not important	1

Table 26 displays the results.

The results showed that the majority of the Respondents placed some importance on this issue. One Respondent selected Extremely important. Two Respondents selected Very important. Five Respondents selected Important, while one Respondent selected Not important.

4.5.4: The importance to support other eco-friendly businesses?

(Appendix A, Q. 20)

Table 27: View of supporting eco-friendly businesses

Support eco-friendly businesses	Respondents
Extremely important	1
Very important	2
Important	3
Not important	4

Table 27 displays the results.

The results indicate a mixed reaction. This is an individual opinion of where each of the Respondents sees the business function of their SME in regards to environmental issues. One Respondent selected Extremely important. Two Respondents selected Very important. Three Respondents selected Important, while four Respondents felt this was Not important.

4.5.5: Do you believe it is important to create an eco-friendly workplace?

(Appendix A, Q. 21)

Table 28: Create an eco-friendly workplace

Create an eco-friendly workplace	Respondents
Yes	10
No	0

Table 28 displays the results.

The results show that each of the ten Respondents agreed for the need to create an eco-friendly and safe workplace.

4.5.6: What policies are created for an eco-friendly workplace?

(Appendix A, Q. 22)

Table 29: Current SME's business policies

	Types of policies Respondent already have in place
Respondent 1	<p>Recycle all our cardboard</p> <p>Turn off lights and that sort of stuff at nights</p> <p>Involved in reducing the volume of plastic bags used, over a three year period</p> <p>No policies have been put into place ergonomically as staff are not sitting down for hours at a time</p>
Respondent 2	<p>What is good enough for me, is good enough for my staff</p>
Respondent 4	<p>We have monthly meeting where any business or environmental issues can be raised and discussed, and everything is recorded</p>
Respondent 5	<p>Turn off lights to minimise the cost of the electricity accounts</p> <p>Workplace, well ventilated and heated when necessary, but not overdone</p> <p>Turn computers off when not in use</p> <p>Nightly checks to ascertain computer and monitors are off to reduce the risk of fire</p> <p>All doors in the office are closed at night to reduce the risk of fire</p> <p>Minimise the number of extension leads that run across the office floor area</p> <p>Keep all cords tidy either under or behind office desks</p> <p>Use multi-boxes for plugging PC and monitors and other devices into</p>
Respondent 6	<p>Replaced existing devices with brand new devices using LCD monitors</p> <p>Designing maximum space between desks</p> <p>No back to back computers</p> <p>Customer counter has an inbuilt modesty board</p> <p>Using wireless technology which reduces the number of cables</p>
Respondent 7	<p>Safety Officer reports on an unsafe environment</p> <p>Staff support all recycling efforts</p>

Respondent 8	<p>Try to ensure that all the monitors are set at a resolution that will avoid eye strain of the user</p> <p>Attempt to provide equipment that is ergonomically correct in order to avoid (RSI)</p> <p>I find that working with cables can be a problem especially when testing equipment in a network configuration</p>
Respondent 9	<p>Occupational, Safety and Health policies have been adopted as opposed to specific environmentally friendly policies</p>
Respondent 10	<p>Strong restrictions are placed on staff for electricity and water usage</p> <p>We recycle cardboard</p> <p>The plastic bags we use are recyclable</p>

Table 29 displays the results.

The results indicate a wide range and varied mixture of Respondent practices / policies for dealing with environmental issues based on the individual knowledge of each of the Respondents.

Recycling

It is apparent that the most commonly recognised environmental issue are recycling practices that mostly involve cardboard, and reducing the number of plastic bags.

Using recyclable plastic bags, or getting their customers to use re-usable grocery bags, and reducing the total volume of plastic bags the Respondent uses.

The Respondents recycle ordinary waste as well as e-waste.

Implement ergonomics in an eco-friendly workplace

Other policies include how the Respondents understand the need to use ergonomically designed equipment in order to reduce Repetitive Strain Injury (RSI).

Set monitor resolution set so that staff does not suffer from eyestrain.

To avoid having computers setup back-to-back as this will limit staff exposure to gamma rays output by each computer.

The Respondents also recognise the advantages of staff working closely with customers having a modesty board at the customer service desk.

Reduce energy consumption

When purchasing IT equipment, the Respondents are ensuring that they replace current CRT monitors with LCD monitors.

Those Respondents who have implemented server technology are replacing networked desktop PC's with thin client technologies and LCD monitors.

Switch off devices that not used, including excess lighting.

Cover and tidy up exposed power cables in the workplace

Most of the Respondents recognise the dangers of sprawling power cables and extension cords in a work environment, so have undertaken safety measures such as using multi-boxes for plugging cords into and minimising the number of extension leads that may be used. In addition, the Respondent feels they must make an honest attempt to minimise across floor cabling so that it hidden behind desks, securely tied and out of harms way.

Embrace wireless technology to minimise network expenses

The Respondents are embracing wireless network technology, as it is another way of reducing the expenses of installing the Network cat5 or cat5e twisted pair solid cabling associated with implementing an Ethernet LAN (Mitchell, n. d.).

Other issue preventative policies include:

Business meetings

Monthly meetings where staff can raise issues that may include environmental issues
Ensuring that staff is treated in the same manner as the Respondent treats themselves.

Using eco-friendly building practices

Keeping the work place well ventilated, and at a comfortable temperature year round.
To close all office doors at night to minimise the possible risk of fires.

Occupational Health and Safety policies (OSH)

Use the NZ Government OSH business policies.

4.5.7: What future policies are to be created for an eco-friendly workplace?

(Appendix A, Q. 23)

Table 30: Future SME's business policies

	Future policies to be implemented
Respondent 1	<p>Introduce re-usable shopping bags in order to reduce the number of plastic bags currently used now</p> <p>More recycling policies will be introduced as time goes by</p> <p>Local council body support about picking up waste paper</p> <p>More reduction of Respondent lighting</p>
Respondent 2	<p>Policies created on a as needed basis, particularly in regards to employing a person who needed specific assistance</p>
Respondent 3	<p>Buy more recyclable products</p>
Respondent 4	<p>Interested in implementing IT into the workshop and linking this back to a database so that the technicians can print invoices there, as opposed to coming into the office in their dirty clothes</p> <p>Looking at installing electronic books and catalogues as well</p> <p>Any ergonomic alterations can not be realised until new system is live</p>
Respondent 6	<p>Develop a better understanding of how to implement an environmentally friendly workplace in order to factor in any required changes</p>
Respondent 7	<p>Teach staff what can or cannot be recycled</p>

Table 30 displays the results.

Probable policy changes

Respondents are not amending, or adding to existing policies in the foreseeable future, but will introduce new policies as and when needed.

Reduce use of plastics

The results show that Respondent 1 discussed that as part of the grocery retail sector, they intend to phase out plastic bags and introduce re-usable shopping bags.

They are also looking towards local body council support in order to implement a project where the public will be encouraged to pick up paper waste.

Implement further energy saving strategies

Respondents propose to reduce further reduce energy consumption in regards to business lighting use.

Buy eco-friendly products

Respondent 3 indicates that they will ensure to buy more products that are recyclable.

Introduce ICT into other departments

Respondent 4 intends to implement a computer in the workshop so that technicians do not need to go into the front office to print out invoices, and to use electronic books and catalogues. Ergonomics cannot be finalised until the new system is live.

Learn how to create an eco-friendly work environment

Respondent 6 is going to complete research on how to create an environmentally friendly workplace in order that they can incorporate environmental changes.

Implement eco-friendly awareness programmes for staff

Respondent 7 will continue to enforce their company recycling practices by way of increasing staff awareness of what can or cannot be recycled.

4.5.8: Why do you believe it is not important for an eco-friendly workplace?

(Appendix A, Q. 24)

This option was not selected as each of the ten Respondents had previously selected they believed in creating an environmentally friendly workplace defined in Table 28.

4.5.9: With new ICT do you use the following specifications?

(Appendix A, Q. 25)

Table 31: Specification option selected

Option	Respondents
Yes	10
No	0

Table 31 displays the results.

The results show that from the available two options of either Yes or No, each of the ten Respondents selected the option Yes.

4.5.10: Please select those items that you consider to be important?

(Appendix A, Q. 26)

Table 32: Respondents energy preferences

Energy specifications	Respondents	
Energy	9	
Energy type	Electricity	9
	Solar	2
	Battery	7
CO ₂ Emissions	6	
Recycling	5	

Table 32 displays the results.

This was a multiple selection question and the results showed that each of the ten Respondents made more than one selection. Nine Respondents selected Energy. Energy type was broken into three categories. Nine Respondents selected Electricity as being an important consideration, two Respondents selected Solar power, while seven Respondents selected Battery power.

In regards to CO₂ emissions, six Respondents select this option with only five Respondents selecting the Recycling option.

4.5.11: Do you consider the energy requirements of new ICT?

(Appendix A, Q. 27)

Table 33: Energy requirements of new ICT

Take into consideration of the energy requirements	Respondents
Extremely important	0
Very important	4
Important	5
Not important	1

Table 33 displays the results.

The results show that each of the 10 Respondents do consider the energy requirements when purchasing new ICT devices. None of the Respondents selected the energy requirement option of Extremely important. Four Respondents selected the option of Very important. Five Respondents selected the Important option, while only one Respondent selected the Not important option.

4.5.12: Take into consideration the CO₂ emissions of new ICT?

(Appendix A, Q. 28)

Table 34: CO₂ emissions of new ICT

Take into consideration the carbon emissions	Respondents
Extremely important	1
Very important	1
Important	4
Not important	4

Table 34 displays the results.

The results indicate that Respondents have little knowledge about the impact of CO₂ produced by ICT and how it affects our environment and this is reflected in the results. One Respondent selected the option of Extremely important. One Respondent selected the option of Very important. Four Respondents selected the option of Important, while four Respondents selected the option of Not important.

4.5.13: Take into consideration the recyclable specifications of ICT?

(Appendix A, Q. 29)

Table 35: Consideration of recyclables

Take into consideration recyclables	Respondents
Extremely important	3
Very important	4
Important	3
Not important	0

Table 35 displays the results,

The results indicate that each of the 10 Respondents are very familiar with the topic of recycling. Three Respondents selected the option of Extremely important. Four Respondents selected Very important, while three Respondents selected Important. None of the Respondents selected the Not important option.

4.5.14: Are there any other comments you wish to add?

(Appendix A, Q. 30)

There were no further comments added in this section

4.5.15: How would you rank purchasing 'Green' ICT?

(Appendix A, Q. 31)

Table 36: Purchasing/ hiring 'Green' ICT

Importance of purchasing/hiring Green ICT	Respondents
Extremely high	0
High	5
Medium	3
Low	2

Table 36 displays the results.

The results show that none of the Respondents placed any particular importance on buying ICT that is 'green' specific, therefore none of the Respondents selected Extremely high. Five Respondents selected High. Three Respondents selected Medium, while two Respondents selected the Low option.

4.5.16: ICT professionals obligation to promote 'Green' specifications?

(Appendix A, Q. 32)

Table 37: IT professionals promote 'Green' ICT

Options	Respondents
Yes	7
No	3

Table 37 displays the results.

The results show that seven of the ten Respondents believe that ICT professionals do have an obligation to fulfil and selected the Yes option, while three Respondents selected the No option.

4.5.17: IT supplier choice of if offered recycling options

(Appendix A, Q. 33)

Table 38: Companies offering recycling options

Options	Respondents
Yes	9
No	1

Table 38 displays the results.

The results show that the Respondents swing heavily towards companies offering recycling options, with nine Respondents selecting the Yes option as opposed to one Respondent who selected the option of No.

4.5.18: How cost effective is it to be eco-friendly?

(Appendix A, Q. 34)

Table 39: Cost effectiveness and 'Green'

Importance of purchasing/hiring Green ICT	Respondents
Very expensive	0
Expensive	0
Similar	6
Cheaper	2
Not sure	2

Table 39 displays the results.

The results reflect the opinion that becoming eco-friendly should not be an expensive exercise as none of the Respondents selected the options of Very expensive or Expensive. Six Respondents selected the Similar because they felt the costs should be similar to what they are paying now. Two Respondents felt it should be Cheaper, while two Respondents were Not sure.

4.6: Ink cartridge recycling and refill services

4.6.1: How do you see the importance of using refill services?

(Appendix A, Q. 35)

Table 40: Importance of using refill cartridge services

Importance of using services that refill items	Respondents
Extremely important	1
Very important	3
Important	3
Not important	3

Table 40 displays the results.

The results show a mixed reaction to this question. One Respondent selected the Extremely important option. Three Respondents selected the Very important option. Three Respondents selected the Important option, while the remaining three Respondents selected the Not important option.

4.6.2: Do refilling services provide a cheaper and easier option?

(Appendix A, Q. 36)

Table 41: Cheaper ink cartridges

Options	Respondents
Yes	7
No	3

Table 41 displays the results.

The results show that seven Respondents believe the refilling service is the cheaper option, while three Respondents selected the No option.

4.6.3: If given the option which choice does your SME take?

(Appendix A, Q. 36a)

Table 42: Ink cartridge decisions

Options	Respondents
Buy New	7
Refill	3

Table 42 displays the results.

The results show that seven Respondents will Buy New cartridges while three Respondents use the Refill option.

4.6.4: Would you consider a pick and delivery service?

(Appendix A, Q. 36b)

Table 43: Use a pick-up and delivery service

Options	Respondents
Yes	10
No	0

Table 43 displays the results.

The results show each of the 10 Respondents selected the Yes option.

4.6.5: Would you use a pre-refilled item if available?

(Appendix A, Q. 36c)

Table 44: Pre-refilled replacement decisions

Options	Respondents
Yes	8
No	0
Other	1

Table 44 displays the results.

The results reflect that eight Respondents know about or already use the ink cartridge refilling services, and selected the Yes option; one Respondent selected the Other option, while one Respondent chose not to make a selection.

4.7: Disposal of ICT equipment

4.7.1: Is this equipment taken off the business premises?

(Appendix A, Q. 37)

Table 45: Removal of ICT equipment

Options	Respondents
Yes	8
No	2

Table 45 displays the results.

The results confirm that eight Respondents selected Yes that the equipment is taken off the business premises, while two Respondents selected the No option.

4.7.2: Do you dispose of the ICT equipment yourself?

(Appendix A, Q. 38)

Table 46: Disposal of ICT equipment

Options	Respondents
Yes	9
No	1

Table 46 displays the results.

The results confirmed nine Respondents dispose of the redundant / outdated / or broken equipment themselves while one Respondent selected the No options as their IT representative takes this equipment off the premises.

4.7.3: How does your SME dispose of this equipment at present?

(Appendix A, Q. 39)

Table 47: How SME's dispose of ICT

Disposal methods of ICT	Respondents
Sell it	3
Donate it	6
Keep it	5
Recycle it	1
Dump it	4

Table 47 displays the results.

The Respondents could select more than one option with this question and the results reflect this. Three Respondents indicated they would sell this ICT equipment if they could. Six Respondents said they would Donate it to charity. Five Respondents would keep it. One Respondent would Recycle it, while four Respondents would dump it.

4.7.4: What measures are taken to avoid poisonous leakage?

(Appendix A, Q. 40)

Table 48: Special measures to protect environment

Special measures	Respondents
Place in special containers	4
Recycle	6
Use for parts	4
No special measures taken	2

Table 48 displays the results.

The Respondents could select more than one option in this question. The results show that four Respondents indicate they would place appropriate equipment into special containers if they were provided. Six Respondents would recycle this equipment. Four Respondents would keep the equipment and use it for parts while two Respondents indicate that No special measures would be used.

4.7.5: Where do you store this equipment if not dispose of it?

(Appendix A, Q. 41)

Table 49: Where the ICT equipment is stored

	Comments
Respondent 1	Give it to anyone who wants it Only equipment that may be used in an emergency situation is stored on the business premises
Respondent 2	In my back room or in the shed at home
Respondent 3	At my brother-in- laws house where he will either sell it, or use it for parts
Respondent 4	It is stored on the business premises on one of the mezzanine floor areas, until a decision as been made about what to do with it. If this equipment is not given away it is then later on taken to the transfer station
Respondent 5	I store it in my garage
Respondent 6	We do not store it
Respondent 7	We keep it in a cupboard
Respondent 8	Stored in one of three sheds on my country property
Respondent 9	Non applicable at this point, as they are just implementing IT technology
Respondent 10	Use at home

Table 49 displays the results.

The results show that two Respondents are the only SME's that store the redundant, outdated, or broken equipment on the business premises. As explained in Table 49, one Respondent keeps this equipment purely for emergency purposes, while one Respondent stores it until they make a decision about what happens to it. In total eight Respondents store the redundant, outdated or broken equipment off the business premises.

Once off the business premises the eight Respondents store this equipment as follows. Four Respondents store this equipment in cupboards, garages, and sheds while one Respondent uses the redundant or outdated equipment at home. Two Respondents do not store any of this equipment at all while one Respondent stores the equipment at their brother-in-laws property.

4.7.6: Whom do you get to take the equipment off the premises?

(Appendix A, Q. 42)

Table 50: Removal of ICT equipment from business premises

	Comments
Respondent 1	Either the people who want it IT take the equipment
Respondent 2	Owner
Respondent 3	Myself
Respondent 4	Managers
Respondent 5	My son loves throwing things away
Respondent 6	Owner
Respondent 7	IT person
Respondent 8	Owner
Respondent 9	Not one person has this responsibility. It would depend on who is available. Usually some one that is not busy
Respondent 10	Owners

Table 50 displays the results.

The results show that two Respondents acknowledge that their IT representative is responsible for collecting this equipment.

Five Respondents confirm that they as the owners of the business have the responsibility of taking the equipment off the business premises.

One Respondent confirms that their son is responsible for sorting out and reducing ICT equipment while one Respondent confirms that both managers have equal responsibility in regards to taking the equipment off the business premises.

One Respondent suggests that they do not have any one person whose job it is to take ICT equipment off the business premises, rather that job falls to who-ever may have spare time.

4.7.7: Are you aware of what happens to this equipment?

(Appendix A, Q. 43)

Table 51: Respondents awareness of ICT recycling principals

	Comments
Respondent 1	No idea
Respondent 2	At the dump
Respondent 3	No idea
Respondent 4	No idea
Respondent 5	<p>A lot of it ends up in China as China processes rubbish from all over the world where I have seen children process this rubbish in an unsafe way on television documentaries</p> <p>I am involved in a landfill project up towards Mercer. Landfills do give off Methane. By adding clay layer as well as an artificial layer reduces the leaching of toxins into the environment.</p> <p>This way modern land fills are a lot better than the old landfills</p>
Respondent 6	No idea
Respondent 7	Assumptions : Uses for parts
Respondent 8	No idea
Respondent 9	<p>Depends on where you dispose of it.</p> <p>I guess in a landfill somewhere</p>
Respondent 10	No idea

Table 51 displays the results.

The results conclude that six Respondents all openly admit that they have no idea at all of what happens to the ICT equipment once it has been officially disposed of. One Respondent is adamant that the ICT equipment ends up in a landfill somewhere. One Respondent drew their conclusions about recycling shipped to China, after they had watched a TV documentary that showed western countries sending their recycling to China.

Chapter 5 - Discussion

5.1: Introduction

The objective of this chapter is to find themes by discussing and further analysing the data in Chapter 4

In order to find themes and define the data, the analysis process will be broken into nine individual cases and then brought back to analyse that data as a multi Case. Any reference to a Respondent will now be in the context of an individual Case.

5.2: Qualitative data using narrative analysis

Respondents gave candid responses in regards to the questions asked throughout the interview. The results are a combination of the comments of each of the nine transcribed interviews.

In order to identify the different levels of Respondents knowledge and abilities, there are three categories and one of these categories describes each Respondent. The categories are as follows:

The computer experience categories

1: Did it themselves (Dit) 2: Use family IT (Ufit) 3: IT professional (Itpro)

Table 52: Align Respondent with computer category

Case 1 through 9	Category placed into
Respondent 1	Itpro
Respondent 2	Dit
Respondent 3	Ufit
Respondent 4	Itpro
Respondent 5	Ufit
Respondent 6	Dit
Respondent 7	Itpro
Respondent 8	Dit
Respondent 9	Dit

5.3: Part 3 – Qualitative analysis

5.3.1: Other ICT used

(Appendix B, Q. 9.4)

The researcher was able to identify another eight individual ICT features not included in the questionnaire, defined from the nine interviews.

These devices include an Electronic Funds Transfer at Point of Sale (Eftpos) terminal, Asynchronous digital subscriber line (ADSL) modem, network switch and Compact Disk (CD) or Digital Video Disk (DVD) disk drives, cash registers, VoIP applications, real-time auction application, as well as various telecommunication services such as call waiting and call diversion from landline to cell phone.

Table 53 below displays these results:

Table 53: Other ICT used by Respondents themes

Row number	Respondents using ICT									Number	Other ICT	Themes emerged
	1	2	3	4	5	6	7	8	9			
1	√	√	√	√		√	√	√	√	8	Eftpos terminal	DSL
2	√	√	√	√	√	√	√	√	√	9	ADSL modem	Broadband internet
3	√						√			2	Switch	Network device
4	√									7	CD-ROM / DVD disk drive	Computer media devices
5	√		√			√	√	√	√	6	Cash Register	Sales and cash storage device
6					√	√		√		3	VoIP / Skype	Internet communication
7		√								1	Internet based Car auction real-time software	Internet shopping
8		√								1	Call waiting and call diversion for landline and cell-phones	Telecommunications

One main theme emerged from the above comments and this is, Broadband internet with seven sub-themes; Internet communication, Internet shopping, Tele-communications, DSL, Network device, Computer media device, Sales and cash storage device.

All nine qualitative research Respondents use a landline telephone and have a connection with a fast broadband internet supplier. Roos (2009) specifies that DSL services operate over an ordinary copper wire telephone line, but on a different frequency to a landline telephone. The Public Switched Telephone Network (PSTN) carries these signals worldwide. Without a copper telephone wire and the PSTN service neither an eftp terminal nor an ADSL modem will operate.

Main themes

Broadband internet

Each Respondent connects to the internet via a fast broadband connection. This Connection is used for the business purposes defined below:

Internet communication

Three Respondents as Table 53, row 6 defines, use the VoIP software package Skype. These Respondents are, Respondent 5, Respondent 6 and Respondent 8. From the data displayed in Table 53, rows 6 and 7 strongly indicate a new trend with SME's starting to use internet resources for more than just opening a web browser and using a search engine to find or look for a particular webpage, or for sending e-mail to someone. The computer savvy may communicate with others using Microsoft Messenger Server (MSN), posting messages on bulletin boards, participating in specific chat sites, and have knowledge of or are using web sites such as Trademe for business purposes. For example, Respondent 2 who uses online auction sites like Trademe for buying and selling vehicles as part of his business processes (Skelton & Mc Lay, 2003, p. 406; Trademe, 2009b).

Three of the ten Respondents have moved forward and are implementing real-time applications that work across the internet and used as a practical solution for business purposes. The literature describes the benefits of this application as; free to use, free to download and you can chat for as long as you like to someone at the other end, as long as they also have the application (Skype, 2009). This becomes a much cheaper option than paying long distance telephone rates if you correspond regularly with certain people. This opinion is supported by Statistics NZ (2008, p. 8) who report internet access and tele-communication services sales of 561 million dollars.

Internet Shopping

Respondent 2, is involved in the Car Sales industry and uses a web-based auction application that enables them to either actively participate, or watch the auction in real-time as defined by Table 53, row 7 (Trademe, 2009b). The theme links to both internet communication and broadband internet.

Analysis indicates low numbers of Respondents use web-based applications for business purposes. This analysis is also supported in the literature, by the authors Cunliffe (2006) and Skelton and Mc Lay (2003, pp. 405- 406) who suggest the reason behind this is because SME's do not have the expertise available to them and behind them to implement or maintain web-based technology. The author, David Cunliffe suggests that SME's still have the suspicion that a hacker may break into their computer system (Defending the Net, 2009, Section 3).

Norris (cited in Skelton & McLay, 2003, p. 406) openly criticises the tertiary education sector for turning out IT or ICT graduates who have little or no business knowledge, and it is for this reason that SME's are not being encouraged to develop e-commerce business practices, as are the larger organisations. Sanders et al. (2007, p. 5) specify that just over a third of NZ business have developed a website.

Sub-themes

ADSL Modems

Each of the nine Respondents has implemented fast broadband using an ADSL modem with a dedicated telephone line. This is indicated in Table 53, row 2, giving them internet access and linked to the main theme Broadband internet and sub-theme DSL. Literature supports the view stating that 93% of SME's now use a broadband DSL connection (Statistics NZ, 2006, p. 19).

CD/ DVD disk drives

Row 4, Table 53 indicates CD / DVD disk drive may be a feature in the computers but not all these drives used for business purposes. Respondent 1 pointed out during the interview that the Point of Sale computer disk drives are not used. The remaining nine Respondents made no comment about disk drives. The Respondents who purchased off-the-shelf desktop PC's or laptop computers will have either a CD or DVD disk drive in that machine as they are included as a feature of that machine at time of sale. CD or DVD disk drives link to the theme Computer media devices.

Data security is high priority for SME's as USB devices can be a network security nightmare as they offer fast upload and download speeds on portable hard drives. Literature supports the disablement of both the CD-Rom disk drive and all USB ports on a computer through BIOS settings that effectively stops this form of data transfer as reported by the Info People Project (2009) and Detwiler (2003).

Several reasons why the nine Respondents of the SME's may not protect their computer systems by disabling the computer media devices are defined below:

- A lack of data security awareness and computer knowledge refer to Table 52
- Sensitive data is stored on the server and users are authenticated before they have access to that data
- That the owners have the sensitive data stored on their personal laptop computers and they are the only ways who have access this computer
- Respondents need the CD-ROM disk drive to work so they can back-up data files.

Electronic Cash Registers

From observations on the entry and exist from each Respondent by the researcher, it was apparent that seven Respondents use an electronic cash register in their SME. Table 53 defines the results, row 5. They link to the theme Sales and cash storage device. The researcher was unable to find literature to support the numbers of SME's that use some sort of a cash register.

Electronic Funds Transfer at point of sale

In reference to Table 53 row 1, initially only Respondent1 and Respondent 3 identified their eftpos terminal as an additional ICT device not mentioned in the questionnaire, as used in their SME. Therefore, the researcher made an assumption that eight of the nine Respondents actually use eftpos terminals in their SME's.

This view is supported in the literature where Skelton and Mc Lay (2003, p. 406) report that in NZ there is the high use of eftpos terminals and telephone banking services, to such a degree that there is more than one eftpos terminal for every 54 consumers. As eftpos transfers funds between a customer's and a business bank account over the digital subscriber line (DSL). The eftpos link is the theme DSL.

Network Switch device

Two of the five Respondents, Respondent 1 and Respondent 7 use a switch for connectivity. Respondent 1 will use a switch devices extra in-built security that will enable external communication to occur with the parent company. Respondent 7 has five desktop computers that connect to their network where as a basic router only connects a maximum of four computers or other devices. The remaining three Respondents, Respondent 5, Respondent 9 with smaller LAN's use a router, while Respondent 6 uses wireless technology. Network switch now links to the theme Network device as indicated in Table 53, row 3.

LAN implementation supported by literature that suggests in 2006, 61 percent of SME's has implemented LAN technology and 21 percent of SME's use an intranet (Statistics NZ, 2006, p. 29).

Telecommunication services such as Call waiting and call diversion

Eight Respondents did not mention their use of other telephone services while Respondent 2 discuss how they use other telecommunication services such as call waiting and call diversion for both their landline and cell phone as defined in Table 53, row 8 and linked to Telecommunications. Literature supports the suppositions that call waiting and call diversion services are provided by telecommunications providers such as the company Telecom (Telecom, 2009).

Summary

As discussed above the impact and use of a wide range of ICT devices on a daily basis in a SME is for more entwined in business functionality than initially thought.

5.3.2: How many hours per day is computer on for?

(Appendix B, Q. 11)

The comments made to the researcher by each of the ten Respondents are defined below in Table 54.

Table 54: Respondents responses to their computer usage

Case study	Comments
Respondent 1	Point of Sale computers boxes are left on permanently with the LCD monitors switched off at night
Respondent 2	Used to leave desktop PC on permanently until told it

	was a dumb move
Respondent 4	Turned off every night
Respondent 5	Laptop is used > 8 hours each day Desktop in the office is turned on for 2 or 3 hours during business hours Server is on permanently Server monitor is switched off other than we doing maintenance
Respondent 6	Desktop computers are on during business hours 7 days a week but turned off at nights Server is on permanently, monitor is turned off
Respondent 7	Server is turned on permanently Desktop machines are on permanently Monitors are left on also
Respondent 8	Computers turned off at night Uses standby power as these computers turn on automatically in the morning
Respondent 9	The server is on permanently Server monitor is on also and runs on standby power Desktop computers are switched off at end of business day

What has become strongly apparent to this researcher is awareness from different industry sectors by SME of the current environmental energy issues in regards to using ICT.

Three main themes and five sub-themes have emerged with the main themes Energy conservation, Use Standby power and No energy measures used with sub-themes, Turning computers off at nights, Turning LCD monitors off at nights, and Turning server monitors off when not in use, Computers left on permanently and Servers left on permanently as defined below in Table 55.

Data from different sources that cover a variety of industry sectors that has returned similar data as displayed in Table 55. Table 55 defines the themes and sub-themes and defines which of the Respondents they apply too.

The discussion below applies to the sub-themes that link back to the individual case in Tables 32 and 33. If a Respondent selected any power saving measures from their comments in Table 55, they were categorised as employing “Applies energy conservation,” or “Uses standby power.”

Table 55: Hours computers used themes

Respondent									Numbers	Themes
1	2	3	4	5	6	7	8	9	7	Applies energy conservation
√	√		√	√	√		√	√		
1	2	3	4	5	6	7	8	9	2	Use standby power
							√	√		
1	2	3	4	5	6	7	8	9	1	No energy measures used
						√				
										Sub themes
1	2	3	4	5	6	7	8	9	7	Turn computers off at nights
	√	√	√	√	√		√	√		
1	2	3	4	5	6	7	8	9	8	LCD monitors off at night
√	√		√	√	√	√	√	√		
1	2	3	4	5	6	7	8	9	2	Server monitors off when not in use
				√	√					
1	2	3	4	5	6	7	8	9	2	Computers left on permanently
√						√				
1	2	3	4	5	6	7	8	9	5	Servers left on permanently
√				√	√	√		√		

PC boxes off at nights

The sub-theme turn computer off at night applies here with seven out of nine Respondents confirming that they switch their computers off at the close of the business day. The reason for this is each Respondent is well aware that by doing this, they are conserving energy by using less energy as confirmed by the literature (MIT, n. d., p. 2) as opposed to Respondent 7 who leaves their computers turned on. It is interesting to note the comment made by Respondent 2 in Table 54 that they used to leave their desktop PC on permanently until told it was a dumb move.

Atkinson (2009) suggests the reason ICT users left their computers turned on permanently was they were told to do this by IT representatives, in order to protect them from a large surge of electricity when switched on, where as in the author Atkinson's opinion the expected power surge is minimal.

LCD monitors off a night

Eight out of nine Respondents switch their LCD monitors off at the close of the business day. In the literature written by MIT (n. d., p. 2) is the suggestion that turning LCD monitors off when not in use the business can realise an annual energy saving of 168 kWh per annum. This calculation based on a 17" monitor. Atkinson (2009) suggests the incentive for all ICT users to turn computers off in monetary value is an annual saving of \$146 per computer. The theme Applies energy conservation applies here as well as the sub-theme LCD monitors off at night.

Server monitors off when not in use

Two Respondents commented that they switch off the server LCD monitors while the server is not undergoing maintenance, in order to conserve electricity consumption. The literature confirms this action is a positive move, as discussed above by MIT (n. d., p. 2) and Atkinson (2009). The sub-theme Server monitors off when not in use applies here.

Use standby power

Two of the Respondents admitted that they leave computer boxes on in order to use a preset function that operates in stand-by mode, therefore automatically starting their computers each morning. Atkinson (2009) suggests in his article that the use of stand-by power is only for short-term periods. Whereas a further recommendation is that a computer not used longer than 15 to 20 minutes, should have the configuration set to either sleep or hibernate mode. The theme Use standby power applies here.

Computers and Servers running permanently

As defined in Table 55, the sub-themes Computers left on permanently and Servers left on permanently applies here as Respondent 1 leaves the point of sale desktop PC boxes on permanently, while Respondents 7 left their complete desktop PC's running permanently. All the SME who have server technology link to the sub-theme Servers left on permanently. The literature does not indicate what damage is done to computers switched on permanently. MIT (n. d., p. 2) and Atkinson (2009) suggest there are the additional energy expenses to a business employing this action.

5.3.3: Need to consult with an I.T professional to implement new ICT?

(Appendix B, Q. 12)

The Respondents comments are below in Table 56.

Table 56: ICT implementation decisions

Case study	Q. 12 Comments
Respondent 4	I am reasonably computer literate but will get someone in to assist when we run into problems or need advice Both managers
Respondent 5	My son who is an IT professional
Respondent 6	We have a simple software package that we run I download any necessary system upgrades
Respondent 9	We haven't had anything new since the initial setup, apart from purchasing the laptop

Only four of the nine Respondents commented after making their quantitative selection.

One main theme emerged from the comments which include I do it myself with the sub-themes identified as Use an IT professional when needed, and Haven't needed anyone yet.

Of the nine Respondents, only four Respondents felt inclined to make a comment at this point although each of the four comments represented a different theme.

Table 57 identifies the main themes, and sub-themes associated with the Respondents comments.

Table 57: Who makes ICT decision themes

Respondent									Numbers	Themes
1	2	3	4	5	6	7	8	9		
			√		√				2	I do it myself
										Sub themes
			√	√					2	Use an IT professional when needed
								√	1	Haven't needed anyone yet

I do it myself

Referring to Tables 56 and 57. The sub-theme Use an IT professional when needed applies to Respondent 4 who indicate they use IT professional services. It appears that Respondent 4 feels capable enough to handle some basic computer maintenance issues, while Respondent 6 believes, they have enough technical computer knowledge as the Sub-theme I do it myself is applied here.

Use an IT professional when needed

Referring to Tables 56, Respondent 4 calls upon the researcher's son-in-law for his technical expertise in working with computers when necessary.

Referring to Table 56, Respondent 5 openly comments that they have a son who is an IT professional, and as such discusses any IT issues with their son, before making final decisions.

Haven't needed anyone yet

Respondent 9 commented that they had not needed to replace or repair any of the original ICT since they had set up the network. They had only recently purchased an additional laptop computer.

5.3.4: Who is responsible for purchasing and disposing of ICT?

(Appendix B: Q.13)

The Respondents comments are below in Table 58.

Table 58: Purchase and disposal of ICT

Case study	Q. 13 Comments
Respondent 1	IT make the recommendation. Half of IT is outsourced such as POS to head office (Foodstuffs) IT would make a recommendation to dispose of outdated equipment, but ultimately it is a joint decision between the us and IT as to what finally happens to that equipment.
Respondent 3	The owners
Respondent 4	Both managers
Respondent 7	Combination of owner and IT It recommends new equipment and they take away the old

	<p>equipment</p> <p>Recycling companies such as Brother will come and collect old equipment</p>
--	---

Two main themes emerged from the comments made by four of the nine Respondents. The main themes include, Owner / managers' decision and IT recommendation with one sub-theme of Outsourced.

Of the nine Respondents, only four Respondents felt inclined to make a comment at this point. Two of the Respondents comments returned similar data and identified a theme, whilst two comments identified another theme and the sub-theme.

Table 59 defines the themes and sub-theme.

Table 59: Purchasing and disposing of ICT themes

Respondent									Numbers	Themes
1	2	3	4	5	6	7	8	9	2	Owner / managers decision
√		√	√			√				
1	2	3	4	5	6	7	8	9	2	It recommendation
√						√				
										Sub themes
1	2	3	4	5	6	7	8	9	1	Outsourced
√										

Owner / managers decision

Respondent 3 only operates with basic ICT. This includes a laptop computer, printer / facsimile and eftpos terminal. In reference to Table 20, they make their own decisions as what to purchase and when, through to the disposal of ICT.

Respondent 4 is one of two of the managers of this business. Any ICT decisions are joint decisions.

IT recommendation

Respondent 1 operates a larger SME which uses a Point of Sale system which is linked back via a network, to head office in Auckland. Referring to Table 19 and Table 20, Respondent 1 takes into account any IT recommendations for their business network.

Specified in Table 20, Respondent 1 and their IT representative jointly decide what disposal methods are to be utilised to rid the business of surplus ICT. Any work done on the network that includes a Server, POS computers, and Broadband internet is “Outsourced” to a company defined by the parent company, Foodstuffs.

Respondent 7 works very similarly with their IT representative as does Respondent 1. An IT representative makes network recommendations as defined in Table 19 and Table 20, with the noticeable difference of where the IT representative removes the older ICT from the business premises once replaced.

5.3.5: What knowledge and level of ICT experience do you have?

(Appendix B, Q. 14)

The Respondents comments are below in Table 60.

Table 60: Knowledge and level of experience

Case	Q. 14 Comments
Respondent 4	Able to use the internet and e-mail
Respondent 5	My business is consulting where I give advice to clients in regards to ICT structure cabling. My speciality areas include IT, telecommunications, and computer networks.

Two of the nine Respondents made additional comments to this question. The indication is extremes of computer knowledge from either end of the spectrum.

Table 61: Computer knowledge and experience themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9	1	Advanced ICT knowledge
				√						
1	2	3	4	5	6	7	8	9	1	Basic ICT knowledge
			√							

Two main themes emerged Advanced ICT knowledge and basic ICT knowledge.

Advanced ICT knowledge

At the higher level of the spectrum please refer to Table 21, Respondent 5 defines their level of ICT knowledge, as being in the range of expert as they are a senior Civil Engineer. In reference to Table 19 and Table 56, for additional help and advice, Respondent 5 will utilise their son's practical ICT skills when necessary.

Basic ICT knowledge

At the lower end of the spectrum, Respondent 4 defines their computer abilities as to being able to use the internet and to check e-mail (Table 60). While unknown to what extent their internet and e-mail usage capabilities actually are, the researcher assumes that they can select a search engine to bring up a website and use e-commerce sites such as Trademe or internet banking (Trademe, 2009b). The researcher personally knows that this Respondent uses internet chat such as MSN to correspond with their family members. In regards to e-mail usage, they must process basic skills such as adding contacts to a contact list, able to insert or open attachments, formatting and adding a signature to an e-mail and know how to send and receive e-mail defined in Table 60.

5.3.6: How did Respondents gain ICT knowledge and experience?

(Appendix B, Q. 15)

The Respondents comments are below in Table 62.

Table 62: Gain ICT knowledge and level of experience

Case	Q. 15 Comments
Respondent 1	Personal research
Respondent 4	No tertiary or work experience
Respondent 5	Going on the occasional courses in order to upgrade my knowledge.

	Tertiary qualification but not in IT. Attended Excel courses at the Bay of Plenty Polytechnic Learnt how to type
Respondent 6	Self taught hacker
Respondent 8	Buying and pulling the equipment apart, then rebuilding it

Five of the nine Respondents commented as to how they personally gained their ICT skills.

Table 63: Gain ICT knowledge and experience themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
√			√		√		√		4	Self-taught
				√					1	Tertiary education

Four of the Respondents returned similar data in regards to learning ICT skills with two themes emerging from this; they are Self-taught and tertiary education.

Self-taught

From their comment in Table 62, Respondent 1 indicates their learning experience came through being Self-taught by conducting Personal research. Respondent 1 is into the Itpro category based on their computer experience. Respondent 1 did not provide a further explanation as to what type of research they conducted. From personal experience and supported by the literature, internet resources such as the Microsoft site supply many tutorials that take a user through a systematic process in order to complete a particular task if using one of their products (Microsoft, 2009b). The internet is a never-ending source of information if you know where to look.

Respondent 4 commented about not having gained ICT experience through a tertiary education or work experience, but from just using the devices. In reference to Table 52, Respondent 4 is into the Itpro category based on their computer experience.

Respondent 6 describes themselves as a Self-taught hacker. Please refer to Table 62, they are defined as a Dit category in Table 52. The literature refers to a hacker as:

"a programmer who breaks into computer systems in order to steal or change or destroy information as a form of cyber-terrorism." (The Free Dictionary, 2009a)

Respondent 8 is also classed as Category Dit, refer to Table 52, as describes himself as having learnt about the technician side of ICT, by buying or being given computers that he pulled apart and learnt how to put back together again as described in Table 62.

Tertiary education

In reference to Table 62, Respondent 5 experience and qualifications come from a Tertiary background. Although he does not hold a degree in IT, he has a solid Civil- Engineering background. In order to upgrade his skills, Respondent 5 enrolled in Community Computing courses run by the Bay of Plenty Polytechnic which is supported by the literature, as well as used software that taught him how to type (Brimblecombe, 2003, p. 1).

5.4: Part 4 – Purchasing ICT - Qualitative analysis

5.4.1: On average how often, do you upgrade your ICT?

(Appendix B, Q. 17)

Of the nine Respondents, Respondent 8 was the only one to comment. From this one comment, a theme emerged which is ICT technical abilities.

The Respondents comments are below in Table 64.

Table 64: Average time for businesses to upgrade ICT

Case	Q. 15 Comments
Respondent 8	I am experiencing problems associated with running Windows Vista. Existing software won't run on Windows Vista

Eight on the nine Respondents did not comment.

Table 65: Upgrade ICT themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9	1	ICT technical abilities
							√			

ICT technical abilities

In reference to Table 64, Respondent 8 is an IT professional. As such during the course of his work, he discovered software incompatibilities when attempting to install software that previously ran on Windows XP or earlier versions of Windows operating systems. Dancing smurf (2009) in their blog, comments that they are also having problems loading software onto a computer running the windows Vista operating system, and Microsoft confirms in the literature that there is a problem with loading some software (msdn, 2009).

5.4.2: What is your personal attitude to sustaining ‘Green’ ICT?

(Appendix B, Q. 18)

The Respondents comments are below in Table 66

Table 66: Personal attitudes to sustaining ‘Green’ environment

Case	Q. 15 Comments
Respondent 2	I’m a hoarder so haven’t reduced IT as I’ve replaced it. The belief is that although NZ might try to sustain the green it’s a pointless exercise when up against the larger countries such as China, which has a greater influence on what happens. One guy is extracting precious metals from older computer boxes and cell phones and selling it afterwards
Respondent 4	Something that will become more widely accepted and kept green
Respondent 5	We’re starting to work on clients green buildings and advising them on this. We’re more up to date with this than the average person. Minimise the impacts of people and the building on the environment. For instance a photocopier leaves small particles of black dust in the air around you in a room. In the building we’re designing for a client we will put in an exhaust duct immediately above where they will put the photocopier or printer. This air is vented straight out of the building. Sucked straight out of the building where it is created without circulating

	<p>within the building.</p> <p>All the monitors produce heat whilst turned out. If you reduce the energy consumed then you reduce the heat and amount of carbon emissions. Replace CRT monitors with Flat screen monitors, which will use less energy, which will reduce the heat and reduce the size of the extraction fans needed. Put in an extraction fan where the servers are. This will reduce the heat generated by the servers and extract this heat straight outside</p>
Respondent 7	<p>As a university student, I met another student in class one day and learnt this chap recycled computers. He then reconfigured and donated them to schools and half way houses. This made me aware of what happens to out dated equipment</p>
Respondent 8	<p>I hadn't thought about it.</p> <p>I'm not sure what this means</p> <p>I have a lot of equipment to dispose of at present</p>

Respondents 1, 3, 6, and 9 elected to make no additional comments, where as Table 66 contains comments made by Respondents 2, 4, 5, 7, and 8. Three main themes emerged from the comments and they are, Hoarding ICT, Recycling, Developing Green buildings with three sub-themes identified as, Green theme more acceptable, Change choice of monitors, No comments.

Table 67: Personal attitude eco-friendly themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
	√						√			2	Hoarding ICT
	√			√		√				2	Recycling
				√						1	Developing Green buildings.
											Sub themes
			√	√						2	Green theme more acceptable
				√						1	Change choice of monitors

1	2	3	4	5	6	7	8	9		
							√		1	No comments

There is a diverse range of data returned from this question and the themes are discussed below.

Hoarding ICT

Referring to Table 66, Respondent 2 and Respondent 8 openly admit they never dispose of ICT devices. These devices once finished with, are placed in an empty room in the business building, a garage, or stand-alone shed at their home.

Respondent 8 suggests that a part of this mindset is because he is not exactly sure where to take it. The literature confirms these disposal methods our Respondents use are normal practice for disposing of ICT for NZ ICT users (e-Day, 2007, p. 2).

Recycling

Current issues that surround recycling in NZ include the following points.

Referring to Table 66, Respondent 2 is a self-proclaimed Hoarder, as is Respondent 8. Each of these Respondents well aware of what recycling entails, still select not to partake in recycling activities.

Respondent 2 considers it a pointless exercise to recycle products in NZ as he believes larger countries such as China have a greater influence.

Respondent 7 has witnessed a friend with their recycling efforts, and seen the benefits of this come back to the community as a whole with computers given away to half-way houses and those in need.

Developing Green buildings

Respondent 5 is a civil design engineer. He is actively engaged in developing Tauranga's first 'green' building. Special features include designing extraction fans to go over where servers and photocopiers will be on each floor in the building. Referring to the comments made in Table 66, the black dust particles will be vented out of the building, rather than circulate around the ventilation system to irritate those people working in the building.

Sub-themes

Green theme more acceptable

Respondent 4 in reference to Table 66, commented about how they believe consumers will gradually accept the idea of protecting the environment. One example is how ICT users are continuously being educated about environment issues with a number of video clips available on website sites such as YouTube (2009).

Change choice of monitors

Respondent 5, refer to Table 66, suggests that a change of monitor from CRT to LCD will not only reduce the amount of energy needed to operate them, but will reduce the output of heat and CO₂, and ultimately the size of any extraction fans. Literature supports this comment and suggests the savings can be greater than 50 percent when using an LCD monitor (Energy Star, n. d.).

Respondent 8, refer to Table 66, did not believe he had enough information in order to make comments.

5.4.3: How important is it to your business be eco-friendly?

(Appendix B, Q. 19)

The comments are below in Table 68.

Table 68: The importance to be seen to be an eco-friendly business

Case	Comment
Respondent 1	Important to be show we are doing something towards it. Don't think it will affect many peoples decisions at the moment, but it may going forward. But in the future it will do so.
Respondent 4	In general. Reconditioning engines makes it better for the environment. Products are disposed of in the proper ways ie. Used oil IT: Recycle older computers
Respondent 5	Our clients expect if of us
Respondent 7	We recycle tyres, metals, and wood We charge a recycling fee for tyres as we pay to have tyres recycled We pride ourselves on educating our customers in regards to recycling measures
Respondent 8	It really doesn't matter to customers as they don't enter the workshop

Four of nine Respondents commented about the importance of their SME's to be seen to be eco-friendly while one Respondent does not believe it is important.

Table 69: Being an eco-friendly business themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
√			√	√	√				4	Already recycling
							√		1	No recycling
										Sub-theme
				√					1	Recycling fees

Five of the nine Respondents commented about this issue. Two main themes emerged; Already recycling, No recycling with a sub-theme of Recycling fees.

Already recycling

Respondent 1 in reference to Table 68, confirms that it is important for their business to show they are actively doing something to protect the environment. Although they do not believe the issue of whether or not this business has an eco-friendly conscious is a major consideration for the average consumer at present, he believes it will become more so, as time goes by.

Respondent 4 in reference to Table 68 is already implementing recycling measures. An example of this is where they pour used oil into a special drum and disposed of in the correct way. They specify that a reconditioned engine is eco-friendly as it outputs less CO₂ into the atmosphere. In addition, any ICT is recycled.

Respondent 5 is adamant in reference to Table 68, and Table 66, as an environmental building designer his clients, expects him to be eco-friendly.

Respondent 7 as in reference to Table 68 has implemented a number of recycling measures so therefore, the business itself is seen to be eco-friendly, as they recycle, tyres, metals, and woods.

No recycling

Respondent 8 in reference to Table 68 does not believe it is necessary for his business to be seen to be eco-friendly, as his customers do not enter the workshop.

Sub-theme

Recycling fees

Respondent 7 commented about the costs associated with recycling materials from a business perspective, and how these costs are carried over to their customers. The literature supports this point-of-view in the report by Tyre Track (2009) that specifies a Tauranga based company Tyre Disposal Ltd, collects used tyres, and invoices the companies for this service.

Free disposal of electronic devices delivered to the Tauranga Transfer station are in a designated area. Tauranga company Computer Recyclers, accept older IT devices, rebuild them, and donate to charity or sell them on (Computer recyclers, n. d.).

5.4.4: To be seen supporting other eco-friendly businesses?

(Appendix B, Q. 20)

Comments are below in Table 70.

Table 70: Support of other eco-friendly businesses

Case	Comments
Respondent 1	Probably the same as above. Quite important going forward
Respondent 4	If you're making an effort yourself then you have to be seen to make an effort to support other businesses to maintain a green environment
Respondent 5	All our recycling is going to China and where it is being done is a huge impact on the people doing this. I.e. Pulling the copper off the cables, but they have to burn off the plastic first. Our recycling is having a huge impact on people in the rest of the world. We do tend to network with other businesses in the same field.
Respondent 6	Personally important but not so important from a business prospective

Respondent 8	I haven't considered it
Respondent 9	Our disposable items such as needles and used products like cotton wool and sharps are incinerated. Not much in the way of products that are recyclable other than boxes. One animal cremation company also disposes of some waste products

Four of the six Respondents indicated that if they operated an eco friendly business, if not at present, then definitely in the near future it is important to support other businesses operating likewise. While one Respondent felt although it was personally important, it was not important from a business point-of-view. One Respondent had never considered this action.

Table 71: Support of other eco-friendly businesses themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
√			√	√	√				√	4	Eco-friendly businesses Work together
						√			√		
							√		√	1	Importance based on type and quantity of services

Respondent 8 refer to Table 70, admitted that he had not considered this side of things.

Five of the six Respondents commented positively to this question. Two main themes appeared from the comments. They are, Eco-friendly businesses work together, Importance based on type and quantity of services.

Eco-friendly businesses work together

Literature supports the views of the three Respondents defined in Table 70, this quote below supplied by Roberto Dobles Mora (as cited in, United Nations Environment Programme, 2009, ¶ 5) places the importance of eco-friendly businesses working together as probable because.

"Successful economies of the future will have to be carbon neutral and Africa and other developing countries must not be left behind."

Respondent 1 refer to Table 70, indicated the similar thoughts defined in Table 68.

Respondent 4 in reference to Table 70 strongly believes that if a business is making an effort to create an eco-friendly business, then it is essential to be seen to support other businesses attempting to do the same.

Respondent 5, refer to Table 70, states that they network with other businesses working in the same field.

Importance based on type and quantity of services

Respondent 6 refer to Table 70, felt it was “Personally important” for them to support other eco-friendly businesses, but from a business perspective, not so important.

Respondent 9 in reference to comments in Table 70, suggest they use little in the way of material items that can be recycled other than cardboard boxes that animal products are delivered in, although they work in conjunction with an animal cremation business who disposes of some waste products. They incinerate other disposable items.

5.4.5: Select energy items important to sustain ‘Green’ ICT

(Appendix B, Q. 26)

Four of Nine Respondents added additional comments to this question. Comments are in Table 72.

Table 72: Important energy to sustain Green ICT

Case	Comments
Respondent 2	Europeans will only buy will only buy equipment, which Europe manufactures, in order to support local industries rather than encourage carbon emissions due to freight movement through air Travel. All our equipment comes from overseas; mostly China and I believe this is false economy.
Respondent 3	You do take these things into consideration, but most of it comes down to cost
Respondent 5	Installing solar power is expensive
Respondent 6	I don’t understand enough about the topics CO ² emissions or recycling IT to comment on these issues at present

One main theme emerged Cost with two sub-themes of Importation of ICT equipment and Europeans buy european made

Table 73: Energy items to sustain 'Green' ICT themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
		√		√						2	Cost factor
											Sub-theme
1	2	3	4	5	6	7	8	9			
	√									1	Importation of ICT equipment
1	2	3	4	5	6	7	8	9			
	√									1	Europeans buy european made

Respondent 6 abstained from comment about these issues through lack of knowledge, whilst two Respondents acknowledged the main driving force behind making ICT decisions still comes down to the costs involved in doing this.

Cost factor

Respondent 3 refer to Table 72, indicates that yes you do consider all these other options, but at the end, it still comes down to the final cost.

Respondent 5 refer to Table 72, suggests installing solar power is expensive. He has had experience with expenses related to installing solar power in his campervan.

Importation of ICT equipment

Respondent 1 refer to Table 72, is adamant that most of our ICT equipment is now imported from China and he believes this is false economy. The literature confirms that large computer component companies such as AMD are manufacturing products in China. Xinhuanet (2009) wrote in their article, published in China view, that AMD have organisations on the Chinese mainland, Hong Kong and in Taiwan province.

Europeans buy European made

Respondent 2 was insistent in his suggestion that Europeans are encouraged to buy only European made products in order to reduce the amount of CO₂ that importing these products will produce. The researcher has not been able to find literature to back this statement up.

5.4.6: Take into consideration the energy requirements of new ICT?

(Appendix B, Q. 27)

Comments are in Table 74.

Table 74: Consideration of the energy requirements of new ICT

Case	Comments
Respondent 1	But I don't believe we can choose stuff based on energy requirements Primarily its based on the function it will provide and once you've got few different ones that offer the same function then you might make a decision based on environment concerns
Respondent 4	We are not really considering energy requirements at present as they are mainly looking for equipment that will fulfil the functionality. If they were given the choice of, fulfilling both the functionality and at the same time, the new ICT equipment provides energy efficiency, then the energy efficient option would be an option. It would be better still if given a choice of the same design specifications over different brands and everything else was comparable for the same price
Respondent 6	These factors are also important to our bottom line
Respondent 8	I have not given any thought to this point

Four of Nine Respondents added additional comments to this question. Respondent 8 commented that they had not given any thought to the subject.

Table 75: Energy requirements of new ICT themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
√		√								2	IT functionality
											Sub-theme
1	2	3	4	5	6	7	8	9			
√										1	Select ICT based on energy usage
1	2	3	4	5	6	7	8	9			
								√		1	Select ICT based on cost

One main theme emerged which is IT functionality, with two sub-themes; Select ICT based on energy, Select ICT based on Cost.

IT functionality

Respondent 1, refer to Table 74, believes firstly that when purchasing new ICT devices the criteria is for the device to perform the required functions. They continue to discuss the possibility of if more than one of these devices purchased then it may be probable that a consumer may look at an energy efficient device.

Respondent 3 also suggested that functionality was the main criteria when purchasing new ICT devices.

Select ICT based on energy usage

Respondent 1 was adamant that you could not select an ICT device purely based on its energy usage.

Select ICT based on cost

Respondent 6 suggested that cost was also a major factor to take into consideration as well as energy usage when purchasing new ICT devices.

5.4.7: Take into consideration the carbon emissions of ICT?

(Appendix B, Q. 28)

Comments are in Table 76.

Table 76 : Consideration of carbon emissions of ICT

Case	Comments
Respondent 1	Not sure. I feel that there are other areas where there could be greater savings in regards to carbon emissions. In the big picture, this is less of a concern in our line of business. We would expect the big companies to be looking out for this as part of their own responsibility.
Respondent 4	I didn't realise that the statistics for IT carbon emissions were as high as they are
Respondent 6	Yes obviously it is important but I don't know Most people in NZ wouldn't have a clue about carbon emissions,

	carbon credits, the Kyoto protocol and how this all affects us
Respondent 7	I'm ignorant about ICT and carbon emissions
Respondent 9	Such a small part of what we do

The comments returned by five out of nine Respondents, returned varying data, discussed below under the themes that emerged from the data.

Table 77: ICT Carbon emissions themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9		2	We output low CO ₂ emissions
√								√			
1	2	3	4	5	6	7	8	9		3	Lack of knowledge about CO ₂ emissions
			√		√	√					
											Sub-theme
1	2	3	4	5	6	7	8	9		1	CO ₂ emissions should be big businesses responsibility
√											

Five of nine Respondents commented. Two main themes emerged as We output low CO₂ emissions and of lack of knowledge about CO₂ emissions with one sub-theme; CO₂ emissions should be big businesses responsibility.

We output low CO₂ emissions

The Ministry for Economic Development (2009) supports through the literature the Respondents comments that their SME's do not contribute copious amounts of CO₂ towards the global emissions. Currently there are no polices in place for NZ SME's to purchase carbon credits.

Respondent 1 refer to Table 76, suggests there may be other ways to save money in regards to CO₂emissions, and that his business outputs little in the way of actual CO₂ emissions. They also suggest the large businesses should take the bulk of the responsibility for output of CO₂ emissions.

Respondent 9 refer to Table 76, was adamant that ICT usage is such a small part of their business, that CO₂ emissions was nominal.

Lack of knowledge about CO₂ emissions

Refer to Table 76, Respondent 7 openly admits they know next to nothing about the problems associated with CO₂ emissions that are output by the use of ICT devices.

Respondent 6 in reference to Table 76, goes as far to say that in their opinion most people in NZ would have little knowledge about the Kyoto protocol, CO₂ emissions and carbon credits, and ultimately how they will affect the environment.

Respondent 4 comments, refer to Table 76, came about after the researcher discussed how the literature specified that ICT was responsible for 2 percent of the global CO₂ emissions (Petty, 2007). Although aware of fuel CO₂ emissions prior to this comment, they had no knowledge what-so-ever about ICT CO₂ emissions.

Sub-theme

CO₂ emissions should be big businesses responsibility

Ministry for Economic Development (2009) discusses in the literature where the Carbon Emissions Trading Scheme developed in order for large companies to buy carbon credits based on the annual tonnage of CO₂ emissions output by that business. The combined energy use generated by a business which includes, all fuel costs including land and air transportation, and bulk rubbish placed in a landfill are calculated to form the annual tonnage of CO₂ emissions that business outputs.

Respondent 1, refer to Table 76, felt that big business should take on board the responsibility of reducing global emissions, and the literature indicates this will be the case.

5.4.8: Take into consideration the recyclable specifications of new ICT

(Appendix B, Q. 29)

Comments are in Table 78.

Table 78: ICT recyclable specifications

Case	Comments
Respondent 4	We recycle already by giving old equipment to other staff members This is also the only way things are going to be sustained in the future, otherwise it's going to be a big mess
Respondent 5	People will not recycle for nothing

	A charitable organisation will and decide where best they will recycle, in order to reuse the equipment
Respondent 8	It is a shame to dump the ICT it when it can be recycled I would like to see a scheme where equipment that still functioned could be recycled to the poorer nations I had considered becoming a collection point for e-waste at one point in time

Three of the nine Respondents commented and returned similar data. From this data the one main theme emerged which is Agree with recycling ICT, and three very different sub-themes emerged.

Table 79: ICT recyclable specifications themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
			√	√				√		3	Agree with recycling ICT
											Sub-theme
1	2	3	4	5	6	7	8	9			
			√							1	Future sustainability
1	2	3	4	5	6	7	8	9			
				√						1	Cost of recycling
1	2	3	4	5	6	7	8	9			
								√		1	Collection points

Of the three Respondents who commented on this question, all agreed that for now recycling was a positive move, and to protect the environments resources into the future.

One main theme emerged which is Agree with recycling ICT, with three sub-themes. Future sustainability, Cost of recycling, Collection points.

Agree with recycling ICT

Refer to Table 78, all three of the Respondents agreed it was important to recycle ICT wherever possible.

Respondent 4 suggested they recycled ICT to other staff members if they want it.

Respondent 5 suggested using a company that recycles ICT, that way the computer and hard-drive will be completely cleaned of old data, reformatted and re-built and before being placed in the best situation in order that people can gain the maximum benefits. The literature supports charitable organisations or computer-recycling companies do this (e-Day, 2008c).

Sub-themes

Future sustainability

Respondent 4, refer to Table 78, offered the following opinion that in order to maintain a sustainable environment, then recycling was to become an essential element in order to achieve this goal.

Cost of recycling

In reference to Table 78, Respondent 5 comments about people not recycling for nothing. Respondent 5 was not specific in what they meant by this comment.

Any surpluses in ICT may be given away free of charge to other family members, or as the researcher has done themselves, exchanged other electrical devices in order to upgrade their computer.

The literature confirms that organisations such as e-Day organise ICT collection points where ICT users can take surplus ICT in order to rid themselves of it (e-day, 2008c), or the ICT user can telephone a computer recycling company to make arrangements to drop off surplus ICT (Computer recyclers, n. d.).

Collection points

Respondent 8 refer to Table 78, commented about having considered becoming a collection point.

Local companies such as Computer recyclers (n. d.) now offer something similar so they can gain the necessary parts needed to rebuild computers and another local collection point is the Tauranga Transfer Station where this researcher at no cost has recently dropped off damaged white-ware.

5.4.9: Importance of recommendations to purchase new Green ICT

(Appendix B, Q. 31)

Comments are in Table 80.

Table 80: Recommendation to purchase Green ICT

Case	Comments
Respondent 1	It comes back to functionality of green concerns
Respondent 2	Green is ok, but energy usage, recycling as important
Respondent 4	Only in the respect if it was explained to me that these were the specifications of the product
Respondent 7	I feel that ICT staff wouldn't know if the equipment operated within the green levels as they just want to make a sale

In reference to Table 80, four of the nine Respondents commented on this point.

Table 81: Recommendation to purchase Green themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
√	√									2	Product specifications
											Sub-theme
1	2	3	4	5	6	7	8	9			
			√			√				2	Integrity of ICT sales staff

One main theme emerged and it is Product specifications, with a sub-theme Integrity of ICT sales staff.

Two of the four Respondents returned similar data supporting one-point-of view, while the remaining two Respondents returned similar data supporting the opposite point-of-view and both points-of-view created the main theme and sub-theme discussed below.

Product specifications

New legislation supported in the literature defines that electrical devices including ICT, are graded by the Energy Star system, which labels each device with an Energy Star label (Energy Star, 2008).

Two Respondents refer to Table 80, discuss how they would not be persuaded to buy a green device over a device that offered the functionality that they expected.

Integrity of ICT sales staff

Respondent 4 refer to Table 80, believed he would need the benefits to buy green ICT based on its specifications explained to him, if he decided he wanted to buy new ICT.

Respondent 7, refer to Table 80, suggests sales staff would not necessarily have the knowledge to make green recommendations.

5.4.10: Sales obligation to promote and provide ‘Green’ specifications

(Appendix B, Q. 32)

Comments are in Table 82

Table 82: Promote and provide Green ICT specifications

Case	Comments
Respondent 1	If not given at present, it should be something that IT companies are working towards
Respondent 2	As a car dealer who has to supply this type of information now, I believe that yes ICT professionals do have an obligation to provide that information
Respondent 3	It is up to each individual to make his or her choice. You need to specify if you require environmentally ‘green’ things
Respondent 4	I didn’t realise the importance of this until this interview, but will be taking an active interest in the future I didn’t think there is enough promotion at present, and needs more advertising in the future to make customers more aware
Respondent 8	No one has ever asked me before about this, so I don’t know My customers wouldn’t care less, as they are looking firstly at functionality, and secondly costs as it is considered to be a working tool. Customers are looking at equipment that will make you money, rather than cost you money
Respondent 9	Otherwise no-one will know, and no-one will know any difference

In reference to Table 82, six of the nine Respondents commented on this point.

Two main themes emerged and they are: Obligation for product specifications, Individual choice and sub-themes; To be implemented and Other factors.

Table 83: Promote and provide green specifications themes

Respondents										Numbers	Themes
1	2	3	4	5	6	7	8	9			
	√								√	2	Obligation for product specifications
	√			√						2	To be implemented
			√						√	2	Other factors

Two of the six Respondents returned similar data supporting one-point-of view, while another two Respondents returned data with an opposing point-of-view. The two remaining Respondents took an entirely different track recorded as well.

Taking all six points-of-view created the one main theme and two sub-themes discussed below.

Obligation for product specifications

Respondent 2 refer to Table 82, as part of business procedure discusses how it is mandatory to display fuel economy labels on all the cars for sale in his yard. Therefore, in his opinion, IT professionals must supply the same services. Literature supports the necessity to display fuel economy labels on new and used cars (Beehive, 2008).

Respondent 9 refer to Table 82, asks if IT professionals are not obligated to supply this information then how are the ICT users going to learn about these issues?

As part of the purchasing experience, all consumers make their decision based on a number of variances. For example, make, size, colour, and price; and in addition there is the Energy Star Rating label with its Star chart that displays the annual estimated cost for energy and / or water for normal use of that device, which are now on all electrical devices including ICT (Energy Star, 2008).

Therefore, the bombardment of energy efficiency information will happen to consumers whether they would like it or not. To conclude, Winterford (2007) recommends that organisations need to discuss energy requirements with vendors.

Sub-themes

To be implemented

Respondent 1 refer to Table 82, suggests that if IT professionals are not promoting 'Green' specifications at present, then it is something they need to work towards in the future while Respondent 4 believes more promotion is needed in order to make the consumer more aware.

Other factors

Respondent 3 refer to Table 82, believes it is the consumers responsibility to explain to an IT professional exactly what they want when purchasing new ICT.

Respondent 8 in reference to Table 82 suggests his clients would not be in the least interested in whether or not a device was Energy Star compliant (Energy Star, 2008), rather more interested to know how the ICT functionality was going to increase their profit margins.

Literature supports this point-of-view where Cunliffe (2008a, p.10, ¶ 1) advises that the NZ Government has developed a Digital Strategy document (dc doc) that proposes:

"Decision-makers in our businesses and organisations need to be aware of available solutions and think about how to use digital technology to increase productivity."

5.4.11: Can the return of ICT influence in your choice of IT supplier

(Appendix B, Q. 33)

Comments are in Table 84.

Table 84: Return of ICT influence choice of IT supplier

Case	Comments
Respondent 1	More of a bonus Providing good customer service
Respondent 3	Because the equipment might get recycled rather than taking it to the dump Upgrade things and send them to a third-world country Good to do something else with them otherwise it's a waste of a product even if it is slow to you

In reference to Table 84, two of the nine Respondents commented.

Table 85: Return of ICT influence choice of IT supplier themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
√									1	Good customer service activity
										Sub-theme
1	2	3	4	5	6	7	8	9		
		√							1	Recycle and re-use

One main theme emerged which Good customer service activity with the sub-theme is being Recycle and re-use.

Each of the two Respondents returned different points-of-view. The differing points-of-view created the one main theme and one sub-theme discussed below.

Good customer service activity

Respondent 1 refer to Table 84, considers it a brilliant business strategy that provides good customer service always considered as a bonus to the consumer.

Literature supports this business strategy with well-recognised ICT Company Cannon recycling and re-manufacturing ink and toner cartridges (Cannon, 2009).

Sub-theme

Recycle and re-use

Respondent 3 suggests refer to Table 84, companies offering to take surplus ICT back opens up other opportunities for the community to take advantage. She suggests the ICT devices be re-used. Another option may be export to third-world countries.

Computer recyclers (n. d.) and e-Day (2008c) back these options in the literature.

5.4.12: How cost effective is it to be environmentally friendly?

(Appendix B, Q. 34)

Comments are in Table 86.

Table 86: Is it cost effective to be eco friendly

Case	Comments
Respondent 1	Cheaper in the long run Savings in transport fuel, lighting and power will assist in paying for itself
Respondent 2	Shouldn't be any difference
Respondent 4	Money talks, and if its going to be to expensive to take the green option then people won't do it
Respondent 5	It is difficult to know where or not it is cost effective because we do not have all the figures readily available In theory, it should be cheaper if one looks at the long-term life cycle costs I don't know if it always is
Respondent 6	I just don't know. More information is required
Respondent 7	They have to be competitive to stay in business. A new round of business opportunities could open up in regards to recycling IT equipment

In reference to Table 86, six of the nine Respondents commented.

Table 87: Is it cost effective to be eco-friendly themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
√				√					2	Cost effective should mean cheaper options
1	2	3	4	5	6	7	8	9		
	√		√			√			3	Businesses must be competitive
										Sub-theme
1	2	3	4	5	6	7	8	9		
					√				1	I don't know

Two main themes emerged; Cost effective should mean cheaper options and Businesses must be competitive with the sub-theme I don't know.

Two of the six Respondents returned similar data, while the three Respondents returned data with a different perspective, and one Respondent returned yet more data expressing a different point-of-view as in Table 86.

Cost effective should mean cheaper options

Wenzel (2007, ¶ 1) comments about the reality that “in order to live an eco-friendly lifestyle; a consumer must have plenty of money”, as reported in the literature.

All consumers have numerous shopping options available to them. The Phrase Finder (2009, ¶ 1) provided this well-known phrase; “*Rule of thumb. The price you pay for an item is determined by how much you can afford to spend.*”

Respondent 1 refer to Table 86, suggests cost savings can be made by becoming eco-friendly in regards to using fuels and energy, therefore making it cheaper in the long-term.

Respondent 5 in reference to Table 86 indicates when looking at the long-term life cycle costs, eco-friendly should be a cheaper option, but he is not confident this will be the eventual outcome.

Businesses must be competitive

Respondent 2 refer to Table 86, is adamant that it should not make a difference to existing prices.

Respondent 4 states that people will not comply if the eco-friendly way is expensive, refer to Table 86.

Sub-theme

I don't know

Respondent 6 refer to Table 86, simply did not know, and felt they needed more information before making a comment.

5.5: Part 5 - Refill services

5.5.1: The importance of refilling items such as ink cartridges?

(Appendix B, Q. 35)

Comments are in Table 88.

Table 88: Importance of services that refill items

Case	Comments
Respondent 2	I've never had ink cartridges refilled If you buy a Cannon machine then use the genuine article as you pay for quality, otherwise if you purchase a Dick Smith article you are likely to do damage to the machine if using inferior products
Respondent 4	Makes it very cost effective and recyclable
Respondent 5	They make too much money out of you with ink cartridges
Respondent 6	We use them all the time
Respondent 7	We used an ink refilling company but discovered Ink used in printer cartridges is a different form of ink. This ink coats the roller, which will eventually destroy the machine. We discovered this through personal experience. Our recommendation is that every four refills must be proper ink for that machine Someone hasn't defined any limitations yet about lower quality ink and prospective damage to machines

In reference to Table 88, five of nine Respondents commented.

Table 89: Importance of services that refill item themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
	√								1	Don't use ink refill services
1	2	3	4	5	6	7	8	9		
			√		√	√			3	Use ink refill services
										Sub-theme
1	2	3	4	5	6	7	8	9		
				√					1	Cost effectiveness and recycle
1	2	3	4	5	6	7	8	9		
	√					√			2	Consequences of using inferior products

Two main themes emerged. Don't use ink refill services, and We use ink refill services with the sub-themes Cost effective and recyclable ink cartridges and consequences of using inferior products.

Two of the five Respondents returned similar data, while the remaining three Respondents returned data covering different perspectives as in Table 88.

Don't use ink refill services

Respondent 2 is firm in his decision to purchase products (in this scenario ink cartridges) manufactured by the same company that manufactured his printer. The belief is you pay for quality. Refer to Table 88.

Use ink refill services

Respondent 4, refer to Table 88, confirm they use this type of service all the time, and enjoy the additional benefits defined under cost effectiveness and recycle.

Respondent 6, refer to Table 88, admits they regularly use this type of service.

Respondent 7, refer to Table 88, also use these services but have learnt there are restrictions as discussed below under the consequences of using inferior products.

Sub-theme

Cost effectiveness and recycle

Respondent 4 suggests by using refill services they provide his business with cheaper options as well as the ability of recycling each cartridge.

Respondent 5 acknowledges that he does use these services and adds these comments where cartridge refill business makes a good profit and that it is expensive to use this type of service. Refer to Table 88

Consequences of using inferior products

Respondent 2 refer to Table 88, suggests that purchasing and using generic products from a company such as Dick Smith may actually damage the device. Literature supports this point-of-view where Katie 45 (cited in Bones, 2007) displayed a partial copy of the Magnuson-Moss Warranty Improvement Act (United States of America) in their blogg. This act provided proof, used to warn other blogg users about possible repercussions when using generic ink cartridges as opposed to using manufacturer branded cartridges. The act specified that the main problem associated with using generic ink cartridges was the null voiding of the printer warranty if proved the generic cartridge did the damage. This statement identified that using lower quality ink cartridges can damage printers.

Respondent 7 indicates they have actually experienced damaging devices by constantly using refilled cartridges and suggest that every fourth refill a branded cartridge by the device manufacturers used to avoid this pitfall. Refer to Table 88.

5.5.2: Do re-filling services provide a cheaper and easier option?

(Appendix B, Q. 36a)

Comments are in Table 90.

Table 90: Refilling services provide cheaper and easier options

Case	Comments
Respondent 1	It is cheaper
Respondent 3	Because I buy after hours which means that I can only buy the things I need on a Sunday, from outlet stores such as Warehouse stationary. These other services are not available then
Respondent 4	We buy it new.

	Re-filling is definitely the best way to go, we bought new probably for convenience. At home, we re-fill them as we use very expensive cartridges with the printer at home. Sometimes when you refill you don't get the same quality, and I don't think you can refill a toner cartridge when using a laser printer but we haven't investigated this option
Respondent 5	Companies offering this type of service tend to price at 2/3 of the cost of a new one, therefore still making a good profit. We refill until the cartridge needs replacing I'm anti waste and it also saves money
Respondent 6	It is ridiculous to buy all that plastic wear and throwing it away all the time when you can recycle it. We also get very good service
Respondent 8	I have access to supplies at wholesale prices that ordinary people don't have therefore it works out cheaper for me to use this option

Six of nine Respondents added additional comments.

Table 91: Re-filling provide cheaper and easier option themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9	4	Provides a cheaper option
√			√	√	√					
1	2	3	4	5	6	7	8	9	1	No after hour's service
		√								
										Sub-theme
1	2	3	4	5	6	7	8	9	1	Quality printing for business
	√									
1	2	3	4	5	6	7	8	9	1	Recycle
					√					
1	2	3	4	5	6	7	8	9	1	Other
							√			

From these comments two main themes; Provides a cheaper option and No after hour's service emerged with three sub-themes Quality printing for business, Recycle, and Other. Six of nine Respondents each returned different data displayed in Table 90, but defined below.

Provides a cheaper option

Respondent 1 suggests it is cheaper to refill cartridges as opposed to buying new.

Respondent 4 agrees it is a cheaper option to refill the more expensive ink cartridges used at home, but has not investigated the possibility of refilling toner cartridges.

Respondent 5 states they refill cartridges until cartridges need to be replaced and estimates the cost of refilling in his opinion is still high. Respondent 5 provides an estimation of the second-hand cost is two-thirds of the prices of a new cartridge.

Respondent 6 believes not only is it a great waste to buy products manufactured in plastic and then throw it away at the end, but the company they do business with, provides great customer service.

No after hour's service

Respondent 3 discovered the refilling option was not viable for their business because of the hours they were open. This meant that they could only buy on a Sunday, and these other businesses closed Sundays.

Sub-theme

Quality printing for business

Respondent 4 believes that with refilled cartridges you do not get the same print quality so buys new toner cartridges for business printing as it prints better quality pages in his opinion.

Recycle

Respondent 6 strongly believes that plastic ware such as ink cartridges should be recycled.

Other

Respondent 8 as an ICT business buys ink cartridges at wholesale prices, which gives him greater buying power than an ordinary consumer receives.

5.5.3: Would you consider a pick up and delivery service?

(Appendix B, Q. 36b)

Comments are in Table 92.

Table 92: Cartridge pick up and delivery service

Case	Comments
Respondent 1	Our business is already using a service such as this
Respondent 3	Would solve all those problems
Respondent 5	I use Ink Post in Palmerston North for a lot of the stuff we get They also supply a courier tag to make postage an easier option. Some we put back into the box. Some smaller cartridges are not economic to return to them.

Three of nine Respondents added additional comments.

Table 93: Pick up and delivery service themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9	2	Service in existence
√				√						
										Sub-theme
1	2	3	4	5	6	7	8	9	1	Other
		√								

From these comments, one main theme was identified that is Service in existence and one sub-theme, which is Other.

Two of three Respondents returned similar data displayed above in Table 92.

Refer to Table 93.

Service in existence

Two Respondents explained that that they use services such as this. One Respondent indicated they used a business in Palmerston North where he receives excellent service. The Refill Company also pays for any courier costs.

Sub-theme

Other

One Respondent suggests a delivery service such as this, would solve all their problems associated with replacing ink cartridges.

5.5.4: Would you use a pre-refilled item if this service were available?

(Appendix B, Q. 36c)

Comments are in Table 94.

Table 94: Use of re-refilled cartridges

Case	Comments
Respondent 1	They do not believe that it matters about the condition the replacement item was in, as long as the item worked to expectation
Respondent 2	Nothing wrong with using refills if you wanted to use refills, although I personally don't use a refill service for ink cartridges
Respondent 5	There is a double benefit for using refilled cartridges. For example, the photocopier uses a pre-refilled cartridge and at the same time, the machine gets its service. The cartridge already in the machine came into the room from a filled container provided by the servicing company. In the end, it is more economical to do it this way because it also keeps the photocopier in better working condition with regular maintenance.
Respondent 8	Non applicable for this business please refer to question 35 a

Four of nine Respondents commented.

Table 95: Use of re-refilled cartridge themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9	2	Working condition more important
√	√									
1	2	3	4	5	6	7	8	9	2	Service plus maintenance
				√						
										Sub-theme
1	2	3	4	5	6	7	8	9	1	Other
							√			

From these comments, two main themes emerged; Working condition more important and Service plus maintenance with one sub-theme, which is Other.

Two of four Respondents returned similar data while the remaining two Respondents returned different data as displayed above in Table 94. Below is discussion on the themes. Refer to Table 95.

Working condition more important

Two Respondents indicated working condition of the cartridges was more important than what their physical condition was.

Service plus maintenance

One Respondent commented about the additional benefits of using a Refill cartridge as the maintenance done with the replacement of toner cartridge.

Sub-theme

Other

One Respondent abstained from commenting on this point, while one Respondent commented that there was nothing wrong with using refilled cartridges.

5.6: Part 6 Disposal of outdated / redundant / broken ICT

5.6.1: Is this equipment taken off the business premises?

(Appendix B, Q. 37)

Comments are in Table 96.

Table 96: Is equipment taken off the business premises

Case	Comments
Respondent 1	Some of it yes depending on what it is. If it still works as we keep as a spare in case the new one breaks down.

One of nine Respondents commented.

Table 97: Equipment taken off business premises themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
√									1	Kept as a replacement item

One main theme emerged; Kept as a replacement item.

One Respondent returned data displayed above in Table 96.

Below is discussion on the theme. Refer to Table 97.

Kept as a replacement item

Respondent 1 admit they keep the odd ICT device as a spare for emergency purposes.

5.6.2: Do you dispose of the redundant equipment yourself?

(Appendix B, Q. 38)

Comments are in Table 98.

Table 98: Disposal of redundant / broken ICT

Case	Comments
Respondent 1	We do or IT makes recommendations as to how best dispose of this equipment
Respondent 6	If it cannot be fixed we make a decision and toss it. We don't stack things in a back room
Respondent 7	IT person comes to pick it up and to dispose of it. But that would be conditional on what was going to happen to it
Respondent 9	We haven't had our technology that long yet that we need to dispose of anything It would depend on the type of equipment as to whether or not we would dispose of it ourselves We may do it if it was something small

Four of nine Respondents commented.

Table 99: Disposal of redundant / broken ICT themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
					√				1	Owners dispose of ICT
1	2	3	4	5	6	7	8	9		
√								√	1	IT recommendations with owner disposing of ICT
										Sub-theme
1	2	3	4	5	6	7	8	9		
						√			1	IT person disposes of ICT

Two main themes emerged; Owners dispose of ICT and IT recommendations with owner disposing of ICT with one sub-theme IT person disposes of ICT.

Two Respondent returned similar data, while two Respondents returned different data as displayed above in Table 98.

Below is discussion on the themes. Refer to Table 99.

Owners dispose of ICT

One Respondent confirm they are responsible for disposing of the ICT

IT recommendations with owner disposing of ICT

Two Respondents suggest that it could be a combined decision, based on what type of devices are under discussion.

For smaller items, the owner will dispose of the ICT.

Sub-theme

IT person disposes of ICT

One Respondent is emphatic that their IT representative disposes of all surpluses of ICT.

5.6.3: How does your business dispose of this equipment at present?

(Appendix B, Q. 39)

Comments are in Table 100.

Table 100: Present disposal methods of ICT

Case	Comments
Respondent 2	I am worried about disposing of older computers and cleaning information off the old hard-drives. This is the primary reason I haven't cleared out the old technology
Respondent 7	Don't know yet as this is a new business and we haven't run into this problem yet
Respondent 9	If we were aware of someone who could recycle it we would take this option

Three of nine Respondents commented.

Table 101: Present disposal methods of ICT themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9	1	Removal of data off hard-drive
	√									
										Sub-theme
1	2	3	4	5	6	7	8	9	1	Who recycles IT
								√		
1	2	3	4	5	6	7	8	9	1	Haven't run into this problem yet
						√				

One main theme emerged; Removal of data off hard-drive, with two sub-themes of Recycling the ICT and Haven't run into this problem yet.

Each of the three Respondents returned similar data, as displayed above in Table 100.

Below is discussion on the themes. Refer to Table 101.

Removal of data off hard-drive

One Respondent has a genuine concern about disposing of ICT particularly IT devices because of the data stored on the hard-drive. Literature supports this viewpoint and suggests a company such as Computer recyclers clean wipe hard-drive disks for that very reason (Computer recyclers, n. d.).

Sub-themes

Who recycles ICT

One Respondent suggests they would use the recycling option when the time arrived.

Haven't run into this problem yet

Respondents have not run into this problem yet as they either have IT professionals remove the ICT or have not had ICT long enough to need to consider this option. Refer to Table 101.

5.6.4: What measures are undertaken to protect the environment?

(Appendix B, Q. 40)

Comments are in Table 102.

Table 102: Measures undertaken to protect the environment

Case	Comments
Respondent 5	We place items such as fluorescent tubes into special containers at a particular collection point. If we used more of these, we would have a special container here to be used for this purpose. When disposing of monitors it is best to go to a place that will recycle them as they do contain chemicals.

One of nine Respondents commented.

Table 103: Measures undertaken to protect environment themes

Respondents									Numbers	Themes
1	2	3	4	5	6	7	8	9		
				√					1	Use special containers
										Sub-theme
1	2	3	4	5	6	7	8	9		
				√					1	Recycle ICT due to chemicals

One main theme emerged; Use special containers, with one sub-theme of Recycle ICT due to chemicals.

One Respondent returned data, as displayed above in Table 102.

Below is discussion on the themes. Refer to Table 103.

Use special containers

Respondent 5 considers it important to use special containers when disposing of fluorescent tubes.

Sub-theme

Recycle ICT due to chemicals

Respondent 5 specifies that the most efficient method of disposing of monitors is to recycle them if you can, otherwise an ICT user has to dispose of the devices in an appropriate manner as possible. Otherwise, the chemicals contained in the components could leach into the environment. The design of the newer landfills has a layer of clay and an artificial layer that is known to reduce the toxins leaching through in to the water tables (Table 48, Table 51).

Chapter Six

6: Conclusions

6.1: Introduction

"Towards implementing a 'Green' ICT environment: Attitudes of selected New Zealand small businesses"

The purpose for gathering the data from selected NZ small businesses (SME's) was to discover the real factors as well as each Respondents true feelings and opinions with the emphasis that is now placed on green issues, and how this is affecting business use of ICT.

Previously mentioned in Chapter 1, section 1.4.4, is how SME's have implemented an increasing range of ICT into their daily business activities (Locke, 2003, p. 96). The New Zealand Government in conjunction with the Digital Strategy (DS) promotes the increasing role that ICT plays in regards to SME's. One purpose behind the DS is for all New Zealanders,

"whether young or old, to become confident in the use of ICT, in order to gain social, cultural, and economic benefits" (Cunliffe, 2006, ¶ 2).

When asked during the interview what their thoughts were about buying 'green ICT' the Respondents initial response defined in Table 25 as positive towards the 'Green ICT environment,' displayed cautiousness about buying 'Green' equipment for the sake of buying the 'Green option.' Table 24 defines how nine Respondents upgrade their ICT on a 'As required' basis, therefore the Respondents stipulated that firstly, new ICT must provide the required functionality and if they could buy functionality and 'Green' at the right price, only then would they consider these options. Kalvar can confirm this attitude (2004, ¶ 4) and suggests that once a business decision has been made it is a matter of justifying that decision. While the literature suggests otherwise with a PricewaterhouseCoopers survey (cited in Shah, Christian, Patel, Bash & Sharma, 2009, p. 1) suggesting that 70 percent of consumers expect a growth in the demand of Green ICT within the next two-year period. Gartner (cited in Shah et al. 2009, p. 1), estimates the growth in ICT will contribute 2 % towards the global CO₂ emissions.

The Respondents current business policies defined in Table 29, indicate that nine of the ten Respondents are practicing energy efficiency measures where computers are either switched off when not in use, or are placed in sleep mode in order to reboot at a specific time each morning as discussed by the authors Marnay, Osborn, & Webber (2000, p. 16). Cameron (2009, p.1) discusses in the literature that he doesn't practice energy efficiency and was shocked when he decided to test how much energy his ICT was using and drew the conclusion of 3200 kilowatt – hours each year (p. 2).

Another concern the Respondents have about buying 'Green ICT' was the level of knowledge that ICT sales staff currently have about 'Green' specifications and the quality and honesty of their advice about the different brands discussed with a consumer. Shah et al (2009, ¶ 3) suggest that

"IT professionals and manufacturers will become pressured to reduce the amount of CO₂ that their products use"

That time has come, and the IEEE (2009) has prepared a comprehensive Draft Standard known as the Draft Standard for Environmental Assessment of Personal Computer Products. An example of the development of this standard has seen it become mandatory for manufacturers to place Energy Star Labels on their products and declare which version the product criteria is (p. 21). With all new ICT devices having to display an Energy Star Label, the consumer now has the option of buying the most energy efficient device available discussed by Marnay et al (2000, p. 16) and the Energy Efficiency and Conservation Authority (2008a) as they will be able to identify the energy efficiency of the devices from the Energy Rating Chart.

After analysing both the primary (quantitative) and secondary (qualitative) data, and completing an in-depth literature review to support the data, that all this information will be collated and used to answer the sub-questions defined below. In turn, the combined factors will answer the research question:

6.2: Research sub-questions

6.2.1: Sub-question 1 - What are the main criterions when purchasing ICT?

In conclusion the primary and secondary data identified the main factors as:

1. The leading factor when implementing new ICT is the functionality that that device will provide to the SME. Respondents will not implement 'Green' ICT if it will not provide the functionality that they require

2. The secondary factor is the cost of the device. Respondents were more contented to pay for a device that offered the required functionality
3. Another factor is that Respondents may be more prepared to implement 'Green' if they had several devices that were already providing the required functionality.

Listed below are all the criterions that were gathered from the Primary and secondary data sources.

Define purchasing criterions

- Short-term business objectives or our long-term goals?
- How urgent is it to purchase the ICT, or do we wait awhile?
- What function will be device (s) provide?
- Who and how many people will use this device on a daily basis.
- Where is the data to be stored, on the local hard-drive or do we implement server technology?
- What security measures do we need to consider
- What is the cost of the device (s)?
- Is the technology OSH compliant?
- How do we reduce the cost associated with running these devices?
- Who will implement the new technology?
- What do we do with the existing ICT?

The bold headings are further discussion about each of the criterions.

For example, for an ICT user, the researcher has discovered it is essential to understand what the functionality of the new device once the decision to purchase has been made as supported by the literature (Kalvar, 2004) where a number criterion were determined to be essential.

Short-term business objectives and long-term goals

A reason SME's buy ICT is that it offers functionality that is otherwise lacking in existing technology. Although technology is more cost effective than it has been in the past, replacing technology unless necessary is still an overhead that the average SME will avoid.

This old phrase says it all "if it ain't broke, don't fix it. " Gregory Titelman (cited in Sauerkraut, 2000).

The researcher assumes in order for a SME to purchase new ICT, there has to be strong financial gains or personal motivation behind implementing new ICT, unless it needs to be replaced due to unforeseen circumstances for example, either theft, or through malfunction of the device.

In the case of financial gains, the Respondent will have business objectives and long-term goals. Kalvar (2004, section 3, ¶ 4) defined the business need below which outlines Respondent 4 business proposal discussed in Table 30.

"We need to spend X money to bring F functionality to a section of the company."

During the interview, Respondent 4 discussed their plan to implement computer technology in the workshop department of their business. Implementing ICT would enable mechanical technicians to create electronic job sheets / invoices and access electronic books and journals from the workshop. By introducing technology into the workshop will reduce the instances where the technicians wear greasy and oil strained overalls and work-boots into the main office, as well attempting to monopolise the office computer (Table 30).

Frequency of purchasing ICT

Nine of the ten Respondents selected the option "As required" Table 24. The Respondents actually mean this statement, as they have set no time limits.

One Respondent upgrades his computers yearly, but then again, this Respondent is an IT professional, and can complete the work himself, therefore minimising probable costs.

Define proposed functionality of new device

The Respondents view ICT functionality as the number one criterion when purchasing ICT, based on the data in Chapter 4 and Chapter 5.

Dennis Linde (personal communication, October 15, 2008) discusses how business experience has taught him that clients invest in technology that is supposed to provide functionality with the attitude that this technology will return a profit quickly, because clients view the technology as a working tool (Table 82).

The literature supports the above view with Kalvar (2004, section 3, ¶ 3) providing this example of a business need:

"We need to spend X to get F functionality to create the opportunity for Y profit."

To iterate further, it is essential that the technology tool operate effectively from initial implementation in order for the consumer to justify the investment.

Confirm number of staff to access this device

Based on the Business category (Biz Cat.) and Staff employment category (Staff Cat.) defined in Table 3 that each Respondent would know how many staff would have access to a particular device during and outside business hours.

Data storage

This is a serious topic for businesses whether or not we are talking about electronic data storage or paper-based data storage. In reference to electronic data, five of the ten Respondents have implemented server technology Table 12. Table 12 defines how one Respondent has implemented thin client technology that indicates that all data is stored on the server, while the remaining four Respondents are still using desktop PC's and or laptop computers (Table 15).

There is a gap here in the information as this subject is outside the scope of this research. What is unknown is whether all data is stored on the server, or how many Respondents use the server to run a centralised database.

Four of the remaining five Respondents use a combination of desktop PC and laptop computers. Data can be stored separately on either computer.

Respondent 3 only uses a laptop computer hence the data is stored on that computer.

Use of CD / DVD and USB drives

Respondent 1 raises a valid question about data security in regards to his comment about the business computers still having their CD-ROM drives, and that they are not used for business purposes (Table 53). Although this topic is out of the scope of this research project, it has identified the sub-theme "Computer media devices. "

Detwiler (2003) discusses the ease of disabling all CD, DVD and USB drives through BIOS settings in order to minimise access to business data, previously discussed in Chapter 5, and defined in Table 53.

Will Respondents buy 'Green' ICT?

The Respondents are emphatic that currently, they will not buy 'Green' ICT classified products, over an ICT device that provides the required functionality (Table 82).

The Respondents believe that ICT devices should have their energy ratings promoted if available. The main theme, "Obligation for product specifications" emerged in Table 83 that also defined the previous comment under the sub-themes "To be implemented" and "Other factors."

Table 75 defines the theme of "IT functionality," whereas defined in Table 74 the Respondents specify that if an ICT device must provide firstly functionality and if that device provides 'Green' specifications, then yes, they would be interested in purchasing it as long as that device was within the same price bracket.

The theme that emerged in Table 73 is "Cost factor," after functionality, the cost of an ICT device is still high priority. Table 75 further defines two sub-themes "Select ICT based on energy usage," and "Select ICT based on cost."

Two sub-themes emerged from the comments defined in Table 72, "Importation of ICT equipment" and "Europeans buy european made" (Table 73).

Another suggestion is that if more than one ICT device was fulfilling the functionality, then that consumer may decide to purchase, a purposely-built 'Green' device (Table 74).

Chapter 4, section 4.5.9, displays the questionnaire results of Q. 27 while Chapter 5, Section 5.4.6, defines the actual comments of four Respondents (Table 74).

Occupational Safety and Health (OSH) in the workplace

The Respondents comments in Chapter 4, section 4.5.6, focused the researcher onto OSH and the standards the NZ Government enforce to safe guard staff and consumers alike.

Table 29 contains comments made by Respondent 5 as he confirms the importance of using electrical multi-boxes in order to reduce the number of power cables left uncovered on a floor, and keeping computer cables tidy behind the office desks. The sub-theme "Green theme more acceptable" applies here as using multi-boxes provide an eco-friendly and safer work environment (Table 67).

Further acts of staff ICT safety come under ICT usage and include issues such as exposure to gamma rays by having computers placed closer than one metre apart, or by placing a computer against a wall, where a person is sitting closer than one metre on the other side of that wall. The sub-themes “Green theme more acceptable” and “Change choice of monitors” apply here, as an LCD monitor will output less energy therefore creating less CO₂ emissions (Table 67).

Reduction in operating costs

The sub-theme “Change choice of monitors” emerged from the ensuing discussion by Respondent 5 who suggested that implementing LCD monitors would result in the use of less energy as opposed to working with CRT monitors confirmed by literature (Table 67; Energy Star, n. d.).

Energy Star (2008) reports that laptop computers and thin client technology provides higher levels of energy efficiency over desktop PC's.

Who will implement and maintain the technology?

Implementing and maintaining ICT technology can be a difficult exploit for ICT users. An ICT user must take into consideration the factors of whether or not they have the ICT knowledge, ICT experience, and the technical ability to implement the technology successfully. Two themes emerged from this point, “Owner, / manager's decision,” with the sub-theme of “Outsourced” (Table 59). If a Respondent does not have the knowledge, experience, or ability to make ICT decisions, then they must rely on the advice of an IT professional, and their technical skills to implement and maintain the technology.

Each Respondent has varying ICT knowledge and technical abilities that ranges from the upper to lower spectrums defined in Table 52, and these factors determine which of the 10 Respondents can actually implement and maintain their own ICT as defined in Table 57. The themes to emerge were “I do it myself”, and “Use an IT Professional when needed.”

ICT knowledge

Table 63 defines two themes, “Self-taught” and “Tertiary education” that describes how Respondents gained their ICT knowledge (Table 62). It was interesting to compare the levels of experience those Respondents who are “Self-taught” have. It does not appear to restrict these Respondents to the category of having to “Use IT professional services when needed” as several Respondents came into the “I do it myself” category (Table 57).

ICT experience

Of the ten Respondents, the sub-themes defined in Table 57, “Use an IT professional when needed” applies to seven Respondents who acknowledge their need to use IT support that comes either from family, or from “IT professional services as needed”.

Other supporting themes identified from data defined in Table 57 were Respondents using “IT Professional services as needed” were categorised as having “Basic ICT knowledge,” although one Respondent who “Uses Family IT members” is categorised as having “Advanced ICT knowledge,” but personally lacks the ICT technical ability (Table 61).

The main theme defined in Table 57 of “I do it myself” applies to those Respondents who feel confident to implement this technology themselves (Table 56) and the theme “Advanced ICT knowledge” applies to these Respondents (Table 61).

ICT technical ability

Table 64 defined the difficulties one Respondent was experiencing with the operating system Microsoft Windows Vista. This identified another theme defined in Table 65, “ICT technical abilities.”

The sub-theme, “Haven’t needed anyone yet” defined in Table 57, applies to SME’s that have only recently implemented ICT.

Described in Table 58 how two Respondents indicate they run a larger Ethernet LAN environment. The themes “Basic ICT knowledge” and “Uses an IT professional as needed,” as well as “IT recommendation” applies to both these Respondents (Table 61, Table 57). One Respondent particularly mentioned the sub-theme “Outsourced” in regards to his LAN (Table 58).

6.2.2: Sub-question 2 - Are SME’s concerned about ‘Green’ ICT issues

In conclusion:

1. The primary and secondary data sources reflect that more education is to be completed on this topic in order to make ICT users aware that they do now have ‘green ‘ options available in regards to purchasing ICT. The main factors to emerge from this are that:
 - a. All but one of the Respondents upgrades or replaces ICT on an ‘As required’ basis

- b. Each of the Respondents elect to recycle used ICT as opposed to dispose of it in a landfill
 - c. Respondents are aware that some ICT companies will 'Take-back or offer a Trade-in' deal on new devices.

- 2. The secondary data uncovered the Respondents concerns about the integrity of sales staff who would be selling them their 'Green' ICT. The factors are.
 - a. Lack of knowledge about ICT green specifications by the sales staff
 - b. Sales staff promoting devices in an unbiased and as trustworthy manner to ICT users, who are not as knowledgeable as they are.

- 3. The primary data source backed up by the secondary data, displayed which options most of the Respondents selected, which indicated they are well educated about the fact that computers and lights left on at night use a lot of electricity.

The factors include:

 - a. Respondents turn SME lights, computers, and monitors off each night, essentially to conserve power.

- 4. The primary data returned the following factors in regards to energy types.
 - a. Electricity was the main source of power for ICT
 - b. Battery power is recognised as an essential power supply for ICT devices.

- 5. The primary data displayed the comments made by each Respondent in regards to what company policies have already been implemented in regards to ICT use. The Respondents when implementing ICT, particularly computer technology, do consider the following factors.
 - a. Leaving enough space between computer desks so that computers are not situated back-to-back
 - b. Follow Occupational, Safety and Health regulations in regards to ergonomics, do not leave twisted cables all over the floor, keep everything tidy behind desks and preset device settings at a level to avoid eye strain
 - c. Ensure that there is adequate ventilation around ICT devices to minimise exposure to CO₂ emissions and heat output by the devices.

- 6. The factors returned from the primary data, backed up by the secondary data in regards to CO₂ emissions are.
 - a. Respondents have little knowledge about the CO₂ emissions which are created by the use of ICT, and the effects of these on the environment
 - b. Respondents believe that large businesses should be held accountable for CO₂ emissions.

The bold headings below highlight further discussion on each of the 'Green' points.

Be eco-friendly recycle

Each of the ten Respondents actively participates in recycling practices in one form or another with the data indicating a strong eco-friendly consciousness. The theme "Recycling" emerged from the comments in Table 66, and defined in Table 67.

Each Respondent discusses their perception about the topic, and discusses what expectations or limitations that may have been placed on them to do anything. The Respondents discuss how they recycle ICT devices (Table 68).

The results returned from the Research NZ (2007, pp. 7 - 8) survey found that their results returned similar data to the Respondents who took part in this research.

These Respondents believe that although they practice eco-friendly practices, NZ by it-self cannot change world attitudes, particularly when it is up against large countries like China (Table 26 and Table 70).

Sustainability discussed by Respondents of the Research NZ (2007, p. 8) study, defined recycling as being more mindful of waste and conserving energy.

For example, in Chapter 5, Respondent 6 states that for their business eco-friendly issues are not so much of a problem because the bi-products are limited to cardboard, which is recycled through local collections, but on a personal level in the home, eco-friendly issues are much more important and practised (Table 70). The sub-theme "Green theme more acceptable" emerged and defined in Table 67.

Hoarding ICT devices

The Respondents actual comments in regards to this issue are defined in Table 66. Respondents can hoard their outdated ICT devices for legitimate reasons that may include an aversion to dispose of ICT in local landfills, and a complete awareness of the need to wipe data permanently from the hard-drives, but lacks the knowledge to do so. "Hoarding ICT" defined in Table 67, has emerged as a theme.

Eco-friendly buildings

One Respondent is a civil engineer and discussed his involvement in designing Tauranga city's first eco-friendly building (Table 66). This created another theme in Table 67

“Developing Green buildings.”

Personal integrity of ICT sales staff and professionals

A very different perspective became apparent when one Respondent expressed concern about the reliability and honesty of ICT sales staff based on their knowledge and understanding, to advise or recommend ‘Green’ specifications of ICT to her (Table 80). A sub-theme emerged in Table 81 “Integrity of ICT sales staff,” from discussion over the importance of recommendations to purchase ‘Green’ ICT. The sub-theme identified in Table 83 as “Other factors” highlighted the need for ICT users to be specific when explaining the ICT requirements at the time of purchase.

Eco-friendly businesses

Table 68 and Table 70 define the importance placed on SME's by their customers to be seen to be eco-friendly as discussed by the Respondents.

Recycling themes emerged from this topic. “Already recycling”, “No recycling” with a sub-theme of “Recycling fees” (Table 69). To support other eco-friendly SME the themes to emerge were, “Eco-friendly businesses work together” and “Importance based on type and quantity of services” (Table 71).

Cost effectiveness of being eco-friendly

With the world leaders focused on how to sustain our environment, we as consumers would like to think that we should receive back some form of financial benefit for our efforts in supporting this cause. Table 86 defines how the Respondents felt about this issue. Table 87 identifies the themes that arose from the discussion. “Cost effective should mean cheaper options” and “Businesses must be competitive,” and with a sub-theme “I don't know.”

Existing ICT energy consumption practices

Eight on the ten Respondents are proactive with certain aspects of ‘Green’ in regards to ICT devices. One aspect is the amount of energy that device will consume, especially if it is not being used. On the energy efficiency side as defined in Table 28, eight of ten Respondents follow energy conservation procedures and switch devices off when not in use; including LCD monitors and the server monitor.

Three sub-themes emerged from this in section 5.3.2, “Turning computers off at nights,” “Turning LCD monitors off at nights,” and “Turning server monitors off when not in use” (Table 55). This pattern created a main theme named “Applies energy conservation” discussed in section 5.3.2. The sub-theme “Use standby power” refers to how Respondents can switch on their computers at the start of business day (Atkinson, 2009; Powersavers, 2008; Table 55).

Defined in Table 54 is the Respondent’s use of business computers. Eight Respondents switch their computers on for 8 or more hours each working day. Two Respondents leave their computers on permanently. Those Respondents with laptop computers use them at home also. All servers are switched on permanently. Two sub-themes emerged from this in section 5.3.2, “Computers left on permanently,” and “Servers left on permanently” (Table 55).

Respondents suggested that with an increased awareness of energy usage enforced by implementing the Energy Star Ratings labels, the ICT user would become more conscious about the amount of energy a particular device might use.

Between them, the ten Respondents use 35 IT devices for business purposes (Table 15). This number does not include personal computers.

SME ICT CO₂ emissions

Table 34 indicates the importance each of the Respondents placed on SME CO₂ emissions. The 10 Respondents firmly believed their SME did not produce enough CO₂ emissions to be accountable for, and that it should be large business responsibility (Table 76). As it turns out, these opinions were justified as the literature confirms that small business output little in CO₂ emissions and have no need to purchase carbon credits through the Carbon Emissions Trading Scheme defined by the Ministry for Economic Development (2009). Two themes emerged, “We output low CO₂ emissions,” and “Lack of knowledge about CO₂ emissions,” with the sub-theme “CO₂ emissions should be big business responsibility” (Table 77).

Respondents were astonished to learn that ICT was responsible for 2% of the total global emissions (Petty, 2007, Table 77).

A business can reduce CO₂ emissions by ensuring that ventilation is working correctly and by fumes are vented externally with the use of an extraction fan. This way a SME will ensure that the heat will dissipate into the atmosphere (Table 66). If management initiated strategic office design, which included thoughtful placement of ICT devices and corresponding placement of extraction fans that would provide a better ventilation system in the office and reduce the amount of dust, fumes, and heat, the staff would feel the minimal affects of CO₂ emission from ICT devices.

ICT Take-back or Trade-in offers

ICT manufacturers' such as Dell and Cannon, realise the difficulty that ICT users face when it comes to disposing of older devices. To avoid these issues, the afore-mentioned companies are promoting a "Take-back" scheme where they will collect the older devices from the ICT user for a small fee (Table 84). Alternatively, ICT users can "Trade-in" their older device for a new one.

One main theme emerged defined in Table 85, as "Good customer service" activity, with a sub-theme "Recycle and re-use."

Three energy types currently used with ICT

Neilson (2008, p. 1) completed a national survey to discover what barriers had to be addressed in order for consumers to accept renewable energy resources. These renewable energy options included hydro, solar energy, marine, woody biomass, geothermal, and wind.

Neilson (2008, p. 1) in his report for the Energy Efficiency and Conservation Authority (2008a) suggests the results returned from this survey finds 55 % of the Respondents consider energy efficiency "Important enough to do something about it. In addition, 58% felt that climate change was "Important enough to do something about it. " The sample size was 1000 participants nationwide.

Following are the conclusions from respondents of this thesis that coincide with the literature.

Electricity

Unlike the Neilson report whose intention was to discover Respondents knowledge about electricity, this research is only concerned about how Respondents understand electricity use in conjunction with ICT in the general sense.

Nine of the Respondents consider electricity to be an important energy source, and the literature supports the efforts energy providers such as Trustpower, who have provided their consumers with information in regards to becoming energy conscious and able to make educated decisions based on the annual kW output for the devices (Table 32).

This information covers a range of devices, whether or not used in the home, business, or corporation. (Trust power, 2009). Government policy is now in place so that all new electrical devices including ICT graded by the Energy Star grade and this grade displayed with the energy star chart placed on each device (Energy Star, n. d.).

The use of extraction fans releases ICT generated heat

ICT devices generate heat so it is important for Respondents to understand that these devices need to operate in a well-ventilated situation, in order to function correctly.

Respondents should be aware that secure storage areas designated for a server must be climate controlled in order to keep the server operating at a constant temperature (Table 66). The manufacturer must provide this information and be supported by the IT professional, in order for the Respondents to fully understand the 'importance.'

Battery

Battery life of an ICT device is an important consideration for 'Green' devices as selected by seven of the ten Respondents (Table 32).

An uninterruptible power supply battery generates energy for an emergency where an electricity supply goes down suddenly. If this should happen, the computer system switches over to the Ups system. Depending on the size of the UPS, it can operate from a few minutes to several hours, but was not designed to become a permanent power source for ICT devices. Laptop computers have an in-built Ups battery.

The scope of this research does not cover the topic of UP's back-up power sources used in SME's.

Solar energy

Solar energy accepted throughout society as a heating source for numerous devices. During the interview, Respondent 5 suggested that implementing solar energy was an expensive exercise (Table 72). He has personal experience of this when he installed a solar energy panel on his campervan.

In 2008, the literature confirms the emerging solar technology with the development of a sophisticated portable computerised search and rescue system powered by solar energy and is small enough it fits into a small sized backpack (Jackson, 2008).

6.2.4: Sub-question 3 - What do SME's know about recycling?

So it can be concluded that the following factors are relevant as:

1. The primary and secondary data confirm that the Respondents are surprisingly well informed about recycling issues, and have instigated a number of recycling measures that are not only relevant to their industry sector, but mirror their personal beliefs as well.
2. The primary and secondary data confirm Respondents understand that end-of-life ICT generally ends up in a local landfill. Most of the Respondents strongly believed in recycling ICT to others to avoid placing used ICT in a landfill, unless they have no other choice. The Respondents know that computer components have toxic substances in some of the ICT components that will affect the environment.
3. The primary and secondary data confirms that two Respondents are self-proclaimed ICT hoarders and do not dispose of any used ICT, and that most of the Respondents do not store surplus ICT on the SME premises. Most take the used ICT home to be stored until further arrangements are initiated. Respondents are extremely conscious of the necessity of wiping clean the computer hard-drives of any computer they intend to recycle in order to protect their data. None of the Respondents has actually used either a local body Collection Point or e-Day services for disposing of used or broken ICT.
4. The primary data indicates that some of the Respondents are well aware that the final destination for recycled ICT can be China and other third-world countries.
5. The primary and secondary data confirms that Respondents know about and how most are using the recycled ink cartridge services in their SME to save money. Several Respondents have recycled cartridges delivered rather than having to go to the store to replace an empty cartridge, which saves them time. The Respondents had experienced lower quality printing as the end-result of using recycled cartridges. Respondents were also well aware of the damage to their printers and photocopiers if recycled cartridges were permanently used.

The bold headings below highlight further discussion on each of the 'recycling' factors.

Each Respondent practices some form of recycling. Each Respondent is aware of what they can and cannot recycle, what should be recycled and how it should be contained, in order to dispose of it in an eco-friendly manner, although not all Respondents know exactly where to recycle ICT (Table 78).

Both Table 35 and Table 78 define that each of ten Respondents considers the level of importance of recycling to be “Important” or “Very important” or “Extremely important.”

Table 79 defines the theme “Agree with recycling ICT” that emerged from that data, and the three sub-themes, “Future sustainability,” “Cost of recycling” and “Collection points.”

Recycling practises currently in use

As this research covered ten SME’s in different industry sectors, these practises do vary based on the industry type defined below (Table 68). Although not all of these SME’s recycle ICT at present, most reported they did some form of recycling in an effort to reduce the effects on the environment.

The individual Respondent recycling practices

Table 104 defines the current recycling practices of each Respondent.

Table 104: Individual recycling practices

Respondent 1	Recycles cardboard and plastic bags Uses Ink refilling services
Respondent 2	Does not recycle ICT
Respondent 3	Recycles left over food as animal fodder Recycles ICT
Respondent 4	Recycles IT devices, and oil Uses Ink refilling services
Respondent 5	Recycles fluorescent light bulbs, prints on the reverse side of pre-printed paper and uses Ink refilling services
Respondent 6	Recycles cardboard
Respondent 7	Recycles cardboard, timber, metals, tyres (the cost of recycling is included on the customers invoice for this service to as

	this company pays the collector to collect these tyres)
Respondent 8	Does not recycle
Respondent 9	Some animal waste products are recycled Cardboard
Respondent 10	Unknown

Ink recycling, cartridge pick-up, delivery, cartridge re-use

Chapter 4, section 4.6.2 defines which Respondents use ink cartridge recycling services.

Respondents acknowledge that the result of using recycled ink cartridges do produce lower print quality. Two themes emerged from this point, “Don’t use ink refill services” and “Use ink refill services” (Table 89). Those Respondents wishing to have a higher quality printed product elect to “Buy new” cartridges rather than the cheaper option of “Refill” (Table 42, Table 90). Two themes emerged from the Respondents comments, “Provides a cheaper option” and “No after hour’s service,” with three sub-themes that include, “Quality printing for business,” “Recycle,” and “Other” (Table 91).

Respondents admitted that they liked the idea of a company that picks-up and delivers ink cartridges because it provides an alternative option for the Respondent having to complete that errand themselves, therefore saving them time (Table 43, Table 92). One main theme emerged and that is “Service in existence,” with a sub-theme “Other’ (Table 95).

Respondents liked the thought of reducing the amount of plastic manufactured for ink cartridges by re-using the existing product. The exterior condition of the product did not appear to be of any importance as long as the cartridge performed the necessary functionality (Table 94). The themes to emerge were “Working condition more important,” and “Service plus maintenance.” The sub-theme is “Other” (Table 95). The conclusion is that the Respondents will use a recycled ink cartridge and that as long as the cartridge printed normally, the external condition was not a concern to them.

Disposal of ICT devices / e-waste collection points

Sell ICT devices

Mac Gibbon and Zwimpfer (2006, p. 17) suggest that ICT users will attempt to sell surplus ICT devices and press this point home with their estimate of the annual sales figures for computer systems standing at 22,500, with laptop computers standing at 32,000 as sold on the web-auction site Trademe in 2006. At time of writing, the researcher visited the Trademe web-auction site searching for computers for sale. Current listings include 44 desktop PC's, 97 laptop computers and 8 servers offered for sale (Trademe, 2009a).

Table 47 defines which options the ten Respondents use to dispose of ICT. Table 78 confirms the general opinion that Respondents would much rather donate, or recycle these devices as opposed to selling it or dumping it in a landfill somewhere.

Donate ICT devices

By donating the devices, Respondents avoid the obvious and time-consuming problem of having to physically dismantle the devices and transport that device somewhere.

The receiver of the gift comes to collect it as defined in Table 50 (Mac Gibbon & Zwimpfer, 2006, p. 22). One reason ICT devices may be kept is as a spare is in case of an unexpected breakdown (Table 96). The theme that emerged was "Kept as a replacement item" (Table 97).

Removal of ICT devices off SME premises

Once the decision made to replace the ICT devices, then it is a business decision to remove those devices off the business premises, in order to free-up space.

The Respondents who have the time, technical ability, and available transportation will remove these ICT devices themselves, whilst other Respondents will require the assistance of an IT professional. Table 98 defines who has this responsibility for each SME. The themes to emerge are "Owners dispose of ICT" and "IT recommendation with owner disposing of ICT" and the sub-theme "IT person disposes of ICT" (Table 99).

Storage facilities for surplus ICT devices

If not disposing of the ICT devices, once off the business premises the Respondents have a tendency to store these ICT devices at their homes (Table 49). The devices can be stored in a range of places that include; cupboards, spare rooms, garden sheds, garages and farm out-buildings and confirmed as normal practice by the authors Mac Gibbon and Zwimpfer (2006, p. 18).

E-Waste collection points

Respondents admit to dumping ICT at the Tauranga Transfer station that acts as an e-waste collection point for recyclable white-ware and electronic devices, if there are no other options available to them (Table 47).

Place toxic substances into special containers

It is apparent that only one Respondent uses an e-waste collection service where fluorescent tubes are placed into special containers so that they can be disposed of in an eco-friendly manner, to reduce the chances of the toxic substances leaching into the waterways and causing environmental damage (Table 102). The theme to emerge is "Use special containers" with the sub-theme "Recycle ICT due to chemicals" (Table 103).

Elective choice of non-disposal of ICT

Two Respondents do not dispose of ICT for different reasons (Table 66). Both admit to hoarding these devices and this behaviour according to Mac Gibbon and Zwimpfer (2006, p. 31) is typical for a number of consumers in NZ, because:

- Disposing of these devices was an expensive exercise if they were taken to a local landfill.
- ICT users who did not want to dispose of redundant CRT monitors in local landfills elected to store these monitors.

Wipe hard-drive disks

One Respondent defined in Table 78 had considered becoming an e-waste collection point, while the other Respondent is concerned about securely clearing data off the hard-drives (Table 100).

The theme to emerge here is "Removal of data off hard-drive," with sub-themes "Who recycles IT" and "Haven't run into this problem yet" (Table 101). Mac Gibbon and Zwimpfer (2006, pp. 22–23) report that Computer recycler's based in Tauranga offer a hard-drive disk wipe, but make a small charge for this service.

Recycled products

Ink cartridges

Each of the ten Respondents is familiar with the ink recycling or re-filling services as defined in Table 40 and Table 88. Although familiar with these services one Respondent is an IT professional, who can buy his ink cartridges for wholesale prices, effectively bi-passing the recycling loop (Table 90).

Listed below are the advantages and disadvantages of using ink-refilling services as defined from data returned by the Respondents (Table 88 and Table 90).

Advantages

- It is cheaper to use re-filled cartridges as opposed to buying new
- Re-fill companies provide a drop off and pick-up service
- Cartridges are recycled
- Ink recycler company provides courier tags enabling free postage
- Damaged cartridges are re-manufactured (broken pieces replaced)
- Regular maintenance of printer / photocopier when replacing ink cartridge
- Respondents save money because there are no transportation costs
- Respondents save time as they do not have to go and purchase the cartridges

Disadvantages

- Lower quality printing
- Damage to the devices after repeatedly using re-filled cartridges
- The use of generic products may null and void printer / photocopier warranties
- Limited opportunities available for purchasing re-fill products 7 days-a-week

Re-use and re-manufactured products

Printers / facsimile / photocopier devices

The company Cannon associated with manufacturing Printers / facsimile / photocopier devices now offer a recycling service where they actually re-build cartridges in order to re-use the items. Re-build consists of replacing broken segments of the cartridge with the segment taken from another cartridge (Cannon, 2009).

Computers

Other IT devices re-built and re-used are computers. Individuals or charitable organisations re-build computers using second-hand parts from other computers with the re-built computer sold or given away. Computer recyclers do place a limit on the type of devices they will accept. Mac Gibbon and Zwimpfer (2006, pp. 22–23) specify only computers of a Pentium 166 or newer will be accepted.

The authors Mac Gibbon and Zwimpfer report that Computer recyclers are struggling to find outlets for recycled ICT. Below are the current options available to Computer recyclers for disposing of e-waste:

- *"Components recovery and sale*
- *Scrap materials recovery and sale*
- *Exporting*
- *Storage*
- *Land-filling"*

(Mac Gibbon & Zwimpfer, 2006, p. 24 ¶1)

Literature reports Mac Gibbon and Zwimpfer (2006, p. 27) who suggest a number of these devices are earmarked to be recycled to and used in third-world countries (Table 84). In order to export ICT devices, the recycler needs to purchase a Basel Convention Agreement permit, but not all recyclers do this.

Basel Agreement

Basel Convention Agreement permits provide one way the NZ government and other governments can track just how much recycled ICT makes it way to the third-world countries (Basel Convention, n. d.).

6.3: Comparison of Genders verses ICT experience

Chart 2 defines that seven of the Respondents are male, compared with three Respondents who are female.

6.5.1: Female versus male Respondents

The female Respondents are Respondents 3, 7 and 10. All three female Respondents are a co-owner of Partnership owned SME's.

Of the remaining seven Respondents, two male Respondents operate under the Sole Trader category of SME's while the remaining 5 male Respondents are partnership owned SME's.

Number of ICT devices used daily

The research does not establish that gender determines the size of the SME based on the number and categories of staff who work for that SME. What the research does determine is that male Respondents have a greater variety of ICT devices to use (Table 15).

Table 15 confirms that two female Respondents SME's use one computer. While one female Respondent's SME uses 6 devices on a daily basis compared to three male Respondents SME's that use 6 devices daily. One male Respondent uses 2 devices, one male Respondent uses 1 device, while two male Respondents SME's use 3 devices defined in Table 15.

Computer experience categories

The research concludes that although each of the three female Respondents learnt their computer skills by being "Self-taught." Each female Respondent believes they lack the knowledge and technical ability to implement new ICT without the assistance of an "IT professional service" (Table 20; Table 58).

Table 52 defines that female Respondent 3 is the Cat. Ufit, while female Respondents 7 and 10 are Cat. ITpro. The theme Owner / managers decision defined in Table 59 applies here as both Respondents 3 and 7, believe that they have enough knowledge backed up by IT recommendations to make ICT purchasing decisions.

Table 52 defines the computer categories each of the male respondents has been allotted into. Two male Respondents are ITpro, four male Respondents are Dit, while one male Respondent is Ufit. Table 57 defines the theme "I do it myself" while Table 65 defines the theme "ICT technical abilities" that applies to the Respondents who are Cat. Dit, while the theme "Owner/ managers decision" applies to Respondents who own their SME. For those Respondents who are ITpro the theme "Use an IT professional when needed" and "Haven't needed anyone yet" apply here (Table 57).

Years of experience

Table 23 define the computer experience that each Respondent has.

All female Respondents have over 10 years computer experience, with two Respondents considering they have "Average" computer knowledge while the third Respondent suggests she has "Below average" experience that was achieved through being "Self-taught" and "Work experience" (Table 22, Table 23).

All male Respondents have 10 years or over computer experience. The male Respondents were 'Self-taught" and "Work experience" with two male Respondents having tertiary qualifications as defined in Table 22. Four of the male Respondents considered they have 'Above average" computer knowledge, with the theme ICT technical abilities applying here (Table 21, Table 65).

Table 61 defines two themes that confirm the levels of experience these Respondents believe they have, “Advanced ICT knowledge,” and “Basic ICT knowledge.”

For those who have Above average computer experience the theme “I do it myself” along with the theme “Owner/ managers decision” for three of these Respondents (Table 59). The fourth Respondent uses Family IT. Four male Respondents consider they have “Average” computer knowledge (Table 21) and two male Respondents “Use an IT professional when needed,” and one Respondent “Outsourced” network requirements (Table 59).

In conclusion:

1. Each Respondent that was interviewed, is the person responsible for purchasing or disposing of ICT for that SME. Question 4 asked the Respondent what Gender they were.
2. The primary and secondary data specify the years of computer experience each female and male Respondents has, and how each Respondent gained their knowledge, when compared to the female Respondents, the male Respondents have more ICT devices and the confidence, knowledge and technical ability to work with and maintain these devices.
3. The primary and secondary data specify how the female Respondents need to call in IT professionals to ask advice when purchasing new ICT, and to implement and maintain that ICT.

6.4: Recurring themes

Identified below are themes that have re-occurred on more than one occasion throughout the analysis of Chapter 5.

Recycling

Cost

Haven't run into this problem yet

Basic ICT knowledge

Advanced ICT knowledge

Uses IT professionals as needed

IT recommendation

Green theme more acceptable

6.5: Other areas of research

During the writing of this thesis, it became apparent that a researcher could conduct further investigation of the topics defined below:

6.5.1: How long it will take before facsimiles become obsolete

As discussed above it will only be a matter of time before the facsimile device will become obsolete owing to current and emerging technologies. What existing or emerging technologies are available to replace this invaluable technology?

6.5.2: IT Professionals 'eco-friendly' principals

An interesting future research project could be the investigation into how many IT professionals have made or are making the move towards implementing eco-friendly practices.

6.6: In conclusion

This thesis has identified what a selection of 10 New Zealand SME's current attitudes are towards implementing a 'Green' ICT environment"

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8: Appendix

8.1: Appendices A – Research engine (Questionnaire)



Code Respondent :

This questionnaire will help me get the relevant information for my Thesis Research Project looking at:

“What are the factors that impact on current attitudes in New Zealand small businesses towards implementing a ‘Green’ ICT environment?”

It will take approximately 20 minutes to complete this questionnaire

Part 1	Demographics
--------	--------------

Q1: Where is this business sited?

CBD Suburbs Mt Maunganui Te Puke Kati Kati Other

A1: Please specify name of Suburb:

Q 2: What industry sector identifies your business?

Health IT Tourism Hospitality Retail Other

A2: If Other please specify the name of the industry sector:

Q 3: What is your role in this business?

Owner Manager Other

A3: If Other please specify:

Q 4: What gender are you?

Male

Female

Q 5: How many staff is employed by your business?

Less than 2

2 to 5

6 to 10

11 to 15

More than 15

If greater than 15 please go to Part 6:

Q 6: What hours do staff work? Can select more than one option:

Full Time

Part time

Casual

Other

A6: Please specify Other hours worked:

Q 6.1: How many employees work Full time?

Less than 2

2 to 5

6 to 10

Q 6.2: How many employees work Part time?

Less than 2

2 to 5

6 to 10

Q 6.3: How many employees work casually?

Less than 2

2 to 5

6 to 10

Q 6.4: How many employees come under the other?

Less than 2

2 to 5

6 to 10

Q 6.5: Who are the other?

Family

School Children

On Call

IT

A6.5: Please identify staff position:

Q 7: Does your business use Information and Communications Technology (ICT) in every day business practices?

- | | | |
|-------|--------------------------|--------------------|
| Yes | <input type="checkbox"/> | Go to question 8 |
| No | <input type="checkbox"/> | Go to question 7 |
| Other | <input type="checkbox"/> | Go to question 8.4 |

Q 8: Please explain why this business does not use ICT in every day business practices?

Go to question 12

Q 9: What ICT is available to be used by the staff on a daily basis in your business? You can select more than one option**Q .9.1: Computer**Desktop Laptop Notebook Blackberry PDA **Q****Network****9.2:**Access to Server Access to Network Wireless LAN Ethernet LAN Intranet Internet

Q

9.3 Telephone System

:

- Landline
- Cellphone
- Fax
- VoIP

Q 9.4: Please specify Other ICT:

Q 10: How many computers would be used on a daily basis by everyone working on the business premises?

Name of Equipment	Number Used
Server	
Desktop Computer	
Laptop Computer	
Thin Client Computer	
PDA	
Blackberry	

Q 11: On average how many hours per day would each computer would be turned on for?

- 1 2 or 3 4 or 5 6 to 8 Greater than 8 Permanently

Q 12: Do you need to consult with an I.T professional when intending to upgrade or implement new ICT within your business?

Yes

No

Q 13: Who is responsible for purchasing and disposing of ICT related technology in your business?

Owner

Manager

I.T

Other

A12: If Other please specify:

Q 14: What knowledge and level of experience do you have in regards to ICT?

Expert

Above average

Average

Below average

None

Q 15: How did you gain this knowledge and experience when using ICT?

Tertiary qualification

Work experience

Self taught

Other

A15: If Other please specify:

Q 16: How many years experience do you have?

0 to 2

3 to 5

6 to 10

Greater than 10

Q 17: On average how often do you upgrade your ICT?

Yearly

Two yearly

Three yearly

As required

Q 18: What is your personal attitude towards sustaining a 'Green' (environmentally friendly) ICT environment?

Strongly agree

Agree

Don't agree

Other

A18: If Other please specify:

Q 19: How important is it to your business to be seen to be environmentally friendly?

Extremely

Very important

Important

Not important

Comments:

Q 20: How important is it for your business to be seen supporting other environmentally friendly businesses, e.g recycling companies?

Extremely

Very important

Important

Not important

Comments:

Q 21: Do you believe it is important to create an environmentally friendly and safe work place for your employees?

Yes

Continue with question 21

No

Go to question 23

Comments:

Q 22: What policies have already been created by this business in regards to creating or maintaining an environmentally friendly workplace?

Q 23: What policies are likely to be created by this business in the future to create or to maintain an environmentally friendly workplace?

Go to question 24

Q 24: Why do you believe it is not important to create or to maintain an environmentally friendly workplace?

Q 25: When intending to implement new ICT do you take into consideration any of the following specifications listed in the table below?

Energy requirements	
Carbon emissions	
Equipment recyclable	
Energy Type	Electricity
	Solar
	Battery
	Other

Yes Continue with question 26

No Go to question 27

Q 26: Please select those items that you consider to be important in order to sustain a 'Green' ICT environment. You can select more than one item.

Energy requirements
Carbon emissions

- Is the equipment recyclable
- Other
- Energy Type
- Electricity
- Solar
- Battery
- Other Energy type

A26: Specify other energy type:

Q 27: Do you believe it is important to take into consideration the energy requirements of new ICT equipment in order to assist in sustaining our environment and natural resources?

Extremely important Very important Important Not important

Comments:

Q 28: Do you believe it is important to take into consideration the carbon emissions of new ICT equipment in order to assist in sustaining our environment?

Extremely important Very important Important Not important

Comments:

Q 29: Do you believe it is important to take into consideration the recyclable specifications of new ICT equipment in order to assist in sustaining our environment and natural resources?

Extremely important Very important Important Not important

Q 30: Are there any other comments you wish to add?

Q 31: When receiving recommendations (quotes) for new ICT equipment, how would you rank the importance of purchasing / hiring equipment that operated within a 'Green' environment?

Extremely high

High

Medium

Low

Comments:

Q 32: Do you believe that the ICT Professionals have an obligation to promote and provide their customers with the 'Green' specifications for the equipment to be purchased if it is available?

Yes

No

Further Comment:

Q 33: Would you be influenced in your choice of IT supplier if that company offered you the option of returning outdated or redundant equipment back to them when you were finished with it?

Yes

No

Comments:

Q 34: How cost effective is it to be environmentally friendly?

Very Expensive

Expensive

Similar

Cheaper

Not sure

Comments:

Q 35: How do you see the importance of using services that refill items such as ink cartridges?

Extremely important Very important Important Not important

Comments:

Part 5:

Q 36: Do businesses that offer these refilling services provide a cheaper and easier option for acquiring items such as ink cartridges for your own business when needed?

Yes

No

Q 36 a: If given the option which choice does your business take?

Buy new

Go to question 36

Refill

Continue with question 35.b

A36a: Why is this option taken?

Q 36.b: If it wasn't too expensive would you consider a pick and delivery service?

Yes

No

Comments:

Q 36.c: Would you receive a pre-refilled replacement item if this service was available?

Yes

No

Other

A36c: Please specify Other:

Comments:

Q 37: Is this equipment taken off the business premises?Yes

Continue with question 37

No

Go to question 38

Q 38: Do you dispose of the redundant / outdated or broken equipment yourself?Yes

Continue with question 38

No

Go to question 40

Comments:

Q 39: How does your business dispose of this equipment at present?Sell it Donate it Keep it Recycle it Dump it

Comments:

Q 40: If intending to dump broken or discarded equipment what measures do you take to ensure poisonous leakage into the environment does not take place?Place in special containers
Recycle
Use for parts
No special measures taken
Q 41: Where do you store this equipment if you don't intend to dispose of it?**Q 42: Who do you get to take the equipment off the business premises?**

Q 43: Are you aware of what happens to this equipment once it has been disposed of. For example: Where does it end up?

I would like thank you for taking the time to read this questionnaire and to actively participate in the interview. The data that has been collected will be kept strictly confidential and as part of the data gathering technique it may be used in other research in the future.

Yours truly,

Karen Mc Donald

8.2: Appendices B – Questionnaire Comments



Code KM :

This questionnaire will help me get the relevant information for my Thesis Research Project looking at:

“What are the factors that impact on current attitudes in New Zealand small businesses towards implementing a ‘Green’ ICT environment?”

It will take approximately 20 minutes to complete this questionnaire

Part 1	Demographics
--------	--------------

Q1: Where is this business sited?

CBD Suburbs Mt Maunganui Te Puke Kati Kati Other

A1: Please specify name of Suburb:

Q 2: What industry sector identifies your business?

Health IT Tourism Hospitality Retail Other

A2: If Other please specify the name of the industry sector:

Q 3: What is your role in this business?

Owner Manager Other

A3: If Other please specify:

Q 4: What gender are you?

Male

Female

Q 5: How many staff is employed by your business?

Less than 2

2 to 5

6 to 10

11 to 15

More than 15

If greater than 15 please go to Part 6:

Q 6: What hours do staff work? Can select more than one option:

Full Time

Part time

Casual

Other

A6: Please specify Other hours worked:

Q 6.1: How many employees work Full time?

Less than 2

2 to 5

6 to 10

Q 6.2: How many employees work Part time?

Less than 2

2 to 5

6 to 10

Q 6.3: How many employees work casually?

Less than 2

2 to 5

6 to 10

Q 6.4: How many employees come under the other?

Less than 2

2 to 5

6 to 10

Q 6.5: Who are the other?

Family

School Children

On Call

IT

A6.5: Please identify staff position:

Q 7: Does your business use Information and Communications Technology (ICT) in every day business practices?

- Yes Go to question 8
- No Go to question 7
- Other Go to question 8.4

Q 8: Please explain why this business does not use ICT in every day business practices?

Go to question 12

Q 9: What ICT is available to be used by the staff on a daily basis in your business? You can select more than one option**Q .9.1: Computer**

- Desktop
- Laptop
- Notebook
- Blackberry
- PDA

**Q
9.2: Network**

- Access to Server
- Access to Network
- Wireless LAN
- Ethernet LAN
- Intranet
- Internet

Q

9.3 Telephone System

:

- Landline
- Cellphone
- Fax
- VoIP

Q 9.4: Please specify Other ICT:

Q 10: How many computers would be used on a daily basis by everyone working on the business premises?

Name of Equipment	Number Used
Server	
Desktop Computer	
Laptop Computer	
Thin Client Computer	
PDA	
Blackberry	

Q 11: On average how many hours per day would each computer would be turned on for?

- 1 2 or 3 4 or 5 6 to 8 Greater than 8 Permanently

Q 12: Do you need to consult with an I.T professional when intending to upgrade or implement new ICT within your business?

Yes

No

Q 13: Who is responsible for purchasing and disposing of ICT related technology in your business?

Owner

Manager

I.T

Other

A12: If Other please specify:

Q 14: What knowledge and level of experience do you have in regards to ICT?

Expert

Above average

Average

Below average

None

Q 15: How did you gain this knowledge and experience when using ICT?

Tertiary qualification

Work experience

Self taught

Other

A15: If Other please specify:

Q 16: How many years experience do you have?

0 to 2

3 to 5

6 to 10

Greater than 10

Q 17: On average how often do you upgrade your ICT?

Yearly

Two yearly

Three yearly

As required

Q 18: What is your personal attitude towards sustaining a 'Green' (environmentally friendly) ICT environment?

Strongly agree

Agree

Don't agree

Other

A18: If Other please specify:

Q 19: How important is it to your business to be seen to be environmentally friendly?

Extremely

Very important

Important

Not important

Comments:

Q 20: How important is it for your business to be seen supporting other environmentally friendly businesses, e.g recycling companies?

Extremely

Very important

Important

Not important

Comments:

Q 21: Do you believe it is important to create an environmentally friendly and safe work place for your employees?

Yes

Continue with question 21

No

Go to question 23

Comments:

Q 22: What policies have already been created by this business in regards to creating or maintaining an environmentally friendly workplace?

Q 23: What policies are likely to be created by this business in the future to create or to maintain an environmentally friendly workplace?

Go to question 24

Q 24: Why do you believe it is not important to create or to maintain an environmentally friendly workplace?

Q 25: When intending to implement new ICT do you take into consideration any of the following specifications listed in the table below?

Energy requirements	
Carbon emissions	
Equipment recyclable	
Energy Type	Electricity
	Solar
	Battery
	Other

Yes Continue with question 26

No Go to question 27

Q 26: Please select those items that you consider to be important in order to sustain a 'Green' ICT environment. You can select more than one item.

Energy requirements
Carbon emissions

- Is the equipment recyclable
- Other
- Energy Type
- Electricity
- Solar
- Battery
- Other Energy type

A26: Specify other energy type:

Q 27: Do you believe it is important to take into consideration the energy requirements of new ICT equipment in order to assist in sustaining our environment and natural resources?

Extremely important Very important Important Not important

Comments:

Q 28: Do you believe it is important to take into consideration the carbon emissions of new ICT equipment in order to assist in sustaining our environment?

Extremely important Very important Important Not important

Comments:

Q 29: Do you believe it is important to take into consideration the recyclable specifications of new ICT equipment in order to assist in sustaining our environment and natural resources?

Extremely important Very important Important Not important

Q 30: Are there any other comments you wish to add?

Q 31: When receiving recommendations (quotes) for new ICT equipment, how would you rank the importance of purchasing / hiring equipment that operated within a 'Green' environment?

Extremely high

High

Medium

Low

Comments:

Q 32: Do you believe that the ICT Professionals have an obligation to promote and provide their customers with the 'Green' specifications for the equipment to be purchased if it is available?

Yes

No

Further Comment:

Q 33: Would you be influenced in your choice of IT supplier if that company offered you the option of returning outdated or redundant equipment back to them when you were finished with it?

Yes

No

Comments:

Q 34: How cost effective is it to be environmentally friendly?

Very Expensive

Expensive

Similar

Cheaper

Not sure

Comments:

Q 35: How do you see the importance of using services that refill items such as ink cartridges?

Extremely important Very important Important Not important

Comments:

Part 5:

Q 36: Do businesses that offer these refilling services provide a cheaper and easier option for acquiring items such as ink cartridges for your own business when needed?

Yes

No

Q 36 a: If given the option which choice does your business take?

Buy new

Go to question 36

Refill

Continue with question 35.b

A36a: Why is this option taken?

Q 36.b: If it wasn't too expensive would you consider a pick and delivery service?

Yes

No

Comments:

Q 36.c: Would you receive a pre-refilled replacement item if this service was available?

Yes

No

Other

A36c: Please specify Other:

Comments:

Q 37: Is this equipment taken off the business premises?

Yes Continue with question 37
No Go to question 38

Q 38: Do you dispose of the redundant / outdated or broken equipment yourself?

Yes Continue with question 38
No Go to question 40

Comments:

Q 39: How does your business dispose of this equipment at present?

Sell it Donate it Keep it Recycle it Dump it

Comments:

Q 40: If intending to dump broken or discarded equipment what measures do you take to ensure poisonous leakage into the environment does not take place?

Place in special containers Recycle Use for parts No special measures taken

Q 41: Where do you store this equipment if you don't intend to dispose of it?**Q 42: Who do you get to take the equipment off the business premises?**

Q 43: Are you aware of what happens to this equipment once it has been disposed of. For example: Where does it end up?

I would like thank you for taking the time to read this questionnaire and to actively participate in the interview. The data that has been collected will be kept strictly confidential and as part of the data gathering technique it may be used in other research in the future.

Yours truly,

Karen Mc Donald

8.3: Appendices C - Personal Reflection on my study

This thesis totally consumed me in a way I could never have previously imagined. Once the research question had been identified and the scope of the topic defined, I found myself completely focused on how I, as the researcher was going to collect the relevant information. I selected a mixed method strategy for the data collection. As previously stated in the Acknowledgements section, with my environmental consciousness having been awoken during the course of study, I found that I had thoroughly enjoyed creating the research instrument (questionnaire) to gather the quantitative data. The time spent waiting for ethics approval to come through I considered to be a waste of time, as I was very keen to start the interviews with each of the nine Respondents, which gave me the qualitative data.

Once the data gathering exercise was completed, I sat back for several days in order to analyse and critically review and reflect on the various processes that had already been completed. The focus at this point-in-time was on any mistakes that I had identified in the questionnaire, or during the live interview and what the possible consequences of these were. Did I have to make any changes to existing questions that could have made a difference to the type of responses received? Would I have to add new questions to the questionnaire and therefore ask each of the Respondents for more of their time to answer these questions? After this reflection, my self-analysis of the situation specified that the questionnaire and interviews were returning exactly what I was asking for.

On many occasions, I would find myself critically evaluating each topic for relevance to this research and type of articles that were to be discussed in the literature review. What exactly is it that I am trying to express, and from which angle shall I discuss this point? From a personal perspective, I found the literature review the most difficult section to write because at the start, I did not have a true start point, or a full understanding of what I was attempting to express. Once I had decided on the format, the search for the articles and actual writing became much easier.

Analysing the data became a challenge as I manually entered data into excel spreadsheets, and then manually collated that data in tables in the thesis document. It was once the data had been collated that I found myself running problems. Not quite understanding what it was I now had to achieve, and which was the best method to use to display the results. It is with much appreciation that I thank my supervisors who cajoled me, guided me, and finally led me to the point that I am now at.

Self-reflection often made me consider if I was writing up the information and primary and secondary data, in the most meaningful way. After some thought, I would conclude that I was happy with the quality of the material I had provided, as I believed it is relevant to the topic and questions in the questionnaire.

My supervisors have on several occasions actually asked me, "What is it you are trying to say?" It is now blatantly obvious that my daughter Adele is right when she describes my style of writing as a passive writer, as I do have the tendency to dance around the topic without specifying a direct answer.

This thesis is something I had never envisaged happening in my life. I am so proud to acknowledge that I have attained this level of qualification, as it is quite an accomplishment