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by

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Green IT in an Iridescent World



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iridescent *ir·i·des·cent*

Producing a display of lustrous, rainbowlike colors
an iridescent oil slick

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2. I have used the APA convention for citation and referencing. Each contribution to, and quotation in, this case study entitled '**Green IT in an Iridescent World**' from the work(s) of other people has been attributed, and has been cited and referenced.

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1 Executive Summary

Climate change is a significant and compelling issue that has captured the attention of world leaders and driven them to action. In 2015, 195 countries collaborated and developed the Paris Agreement. The sole aim of the agreement is to reduce global environmental impacts and slow down climate change.

As consumers endeavour to reduce reliance on fossil fuels and move to cleaner, more environmentally friendly energy solutions, the oil industry is significantly affected as a result of reducing demand for product.

As an organisation with oil as a primary product, Z Energy, the subject of this case study, is forced to examine their operations and investigate alternative product options.

Z is a downstream fuel business, purchasing crude oil on the international market, importing it into New Zealand and processing it into fuel. This is distributed and sold to retail and commercial customers. Z own and manage over 200 service stations.

Sustainability matters at Z. They have a sustainability strategy with goals to use less and waste less in their business; reduce the carbon intensity of customers; reduce reliance on fossil fuels and support New Zealand businesses and communities.

Z is faced with a challenging issue. They are committed to running an environmentally sustainable business but operate in an industry where the primary product has significant negative impacts on the environment.

It is vital that the commitment to environmental sustainability is supported through internal business functions, and to examine this challenge, this case study looks at Z through two lenses.

1. The Information Systems Triangle is used to evaluate alignment between Z's sustainability strategy and their organisational and information strategies. In order to successfully deliver on their sustainability goals, Z should ensure they have alignment between the three strategies and furthermore, the organisational and information strategies should be designed to complement the business (sustainability) strategy.
2. The Green IT Maturity Model is used to evaluate the ICT practices at Z to determine if they are positioned to support the corporate sustainability goals. As a sector ICT contributes to

climate change by emitting 2-3% of total carbon emissions. As well as a part of the problem, ICT can also contribute solutions to reduce emissions in other sectors.

The methodology used to gather research data was a combination of semi structured face to face interviews with selected Z employees, analysis of Z strategy documents and review of academic and practitioner research and frameworks.

The data was evaluated against the IS Strategy Triangle and analysis found that while the sustainability strategy is in place, it is not supported by or aligned with the organisational and information strategies.

The data was also used to evaluate the maturity of the ICT practices by comparing the current ICT processes as described by interviewees against each maturity measure in the Green IT Maturity model. While some areas were assessed to have average maturity, overall the maturity of the practices was low.

Recommendations were developed that if implemented would result in convergence between the business sustainability strategy and the organisation and information strategies. Other recommendations were to improve the maturity of the ICT practices through:

- implementation of an ICT sustainability strategy
- establishment of green ICT maturity goals
- encouragement of telecommuting
- implementation of guidelines for ICT asset procurement, and
- development of guidelines for ICT asset disposal.

2 Case Description

2.1 Background

Z Energy (Z) positions itself as a corporate thought leader in terms of sustainability, a front runner with sustainable activities in the fuel sector in New Zealand. Z is vocal in social media on the topic of sustainability and environmental concerns, regularly engaging with staff and suppliers on sustainability topics.

Z is a downstream fuel business purchasing crude oil on the international market, importing it into New Zealand and processing it into fuel (petrol, diesel, aviation gas etc.) at a refinery north of Auckland. The fuel is distributed and sold to retail and commercial customers, including airlines and trucking companies. Z own and manage over 200 service stations.

Recently, corporate office staff have been asked to improve recycling efforts. The corporate office has the lowest results of all Z sites when measuring 'waste to landfill'. Of Z's four sustainability targets within the sustainability strategy, reduction of waste is seen as the goal most easily influenced and impacted by all staff, unlike other goals which will largely be delivered by smaller pockets of staff in specialist roles.

Measurement of progress against the sustainability goals is the job of the Corporate Sustainability Manager, Emma Wyatt. Emma believes that Z has aspirational sustainability goals, achievable with hard work. She thinks the goals can be used to provide a common focus on sustainability across the organisation. Emma says:

“My role exists to try and keep people engaged and keep people feeling like they are making a difference, keep information shared across the company because there is heaps going on”.

Emma has been at Z for five months, filling in while the permanent Sustainability Manager is on parental leave. Emma spent her first two months learning about the background of the sustainability goals and discovering where the work to achieve them is occurring. Now that she has information, Emma wonders if her team could be doing more to engage with other Z business units to ensure they know what they can do to help achieve the goals. Emma has noticed that Z is very busy with multiple areas of focus, including operationalisation of a new Biodiesel Production Plant, integration of the recently purchased Caltex business in New

Zealand and upgrading the ERP system. Emma wonders if the current sustainability efforts are directed in the right place which are in her view, those areas where the most progress can be made with the least amount of resources.

Emma, with Mark the CEO, recently ran a company meeting to update employees on progress of the sustainability initiatives. The meeting was full of rich information on progress made to reduce the amount of waste Z sends to landfills. Examples of improvements made at service stations were shared along with suggestions of how to reduce waste at the corporate office. The meeting ended with a request for employees to make more of an effort to recycle their rubbish.

Anthony and Rachel, both managers in the Information and Communications Technology (ICT) team attended the meeting. Afterwards, walking back to their desks they discussed that while they were both excited about progress made with sustainability and the activities they had just learned about, neither of them really knew how they could contribute to the initiatives nor were they aware of any expectations of their roles to contribute. Also on their minds was that the new Chief Information Officer (CIO), Carly Nelson had recently started and she was known to have a keen interest in sustainability within ICT which was causing a lot of talk about what changes might be made in the technology area.

Carly had shared stories with the team about initiatives she delivered for a previous employer to improve sustainability in ICT. Carly talked about establishing a relationship between the corporate sustainability and ICT teams before starting anything. She also mentioned the use of maturity frameworks specific to green IT as a way to make progress.

Anthony has been at Z for six months and the town hall meeting was the first time he had heard anyone discuss sustainability in detail and expectations of staff to help to achieve the goals. While personally interested in protecting the environment, Anthony is now nervous about what he is supposed to be doing, if anything, in regard to sustainability in his job as ICT Infrastructure Manager. Anthony's main concern is that there is already a program of work in ICT for the rest of the year and sustainability is not mentioned. There could be some things he should be doing but his knowledge about sustainability in ICT is virtually non-existent.

Rachel, with Z for two years, has worked with the sustainability team before. As Operations Manager Rachel is responsible for the user experience of technology and helped the Sustainability Manager with issues she was experiencing with video conferencing. Once the

issues were resolved the only time Rachel had anything to do with the team was at company social occasions.

Recently Rachel went to a talk about smart cities. She was impressed with the ideas that were shared about how technology can be used to reduce energy consumption. Rachel wondered why at Z, ICT was treated as another consumer of energy. The sustainability team seemed unaware that ICT could be part of the solution.

Both Anthony and Rachel were left unsettled by the meeting and unsure of what, if anything they should do about it.

2.2 The Sustainability Strategy at Z

Over the past few years Z has increased the maturity of their sustainable practices. This is as a result of their aim to reduce reliance on fossil fuel and their goal to reduce carbon emissions, energy and water use and waste that goes to landfill.

Z has developed a ‘stand’ on sustainability, (Appendix 1) and pillars to support the stand (Appendix 2).

Z defines sustainability as “acting in a way that benefits the future of the neighbourhoods we operate in and the planet we live on. We think it’s good for business, good value and good sense” (Z Energy, 2015).

Four ‘stands’ make up the Z sustainability strategy, owned by the Sustainability Manager who is also responsible for the achievement of the goals.

The sustainability stands are widely advertised externally and internally at Z. They are featured on the corporate website and intranet pages. When asked, Z employees can quote one or two of the stands, with ‘using less and wasting less in our business’ being the most well-known stand.

The four sustainability stands at Z are:



When interviewed, Mark Beaufort, Z Chief Executive Officer comments that **“stands number one and number four are almost bookends; it's how you can prove you are serious about this stuff by doing stuff for yourself with other people and the other two are the call to the customer to engage with doing something in this space”**.

Mark explains that **“using less and wasting less in our business”**, was developed to make sure that Z was taking care of its own backyard. He says that **“it's difficult to have credibility with other people by urging them or cajoling them or encouraging them to do something themselves with the products you sell, when you don't even have a good record yourself. So don't criticise someone's back garden before you take care of your own”**.

Stands two and three are about how Z use fossil fuel and how they influence their customers use as well. Mark quotes two examples of how Z is achieving these stands. One, through the building and operationalisation of a Biodiesel plant which produces ‘diesel made from renewable resources’ (Z Energy, 2016), and the other through a software product called Fuelwise. This measures how efficiently drivers are operating vehicles and provides feedback on how they can be driven more efficiently to reduce fuel consumption.

The aim of the final stand **“Supporting New Zealand business and communities”** is to do good things in the local neighbourhood with a view to both environmental and economic sustainability. One of the ways Z does this is to bias procurement to New Zealand suppliers rather than going offshore for cheaper products. Z has grown the capability of a New Zealand company by purchasing new signage for all Z service stations from them, rather than from offshore.

2.3 Z Energy - Organisational profile

Z is committed to New Zealand and evidences this commitment through their 'good in the hood' programmes which donate to local charities. They run the business using kiwis with a heavy dose of New Zealand attitude. Often included in their communications is the slogan, 'Z is for New Zealand' (Z Energy, 2016).

Z was created in 2011 following the sale of the Shell New Zealand downstream oil interests to Infratil and the New Zealand Superannuation Fund. After extensive consumer and product research the Z brand was created. Z listed on the New Zealand stock exchange in 2013. In 2016 Z purchased the Chevron International New Zealand interests. This encompasses the Caltex and Challenge brands and increases Z's market share of the New Zealand fuel industry to 49%.

Z is made up of two profit making business units, Retail and Supply and Distribution. The two core business units are supported by shared service business units, including Financial Services, People and Culture, Sustainability, Health and Safety and ICT.

Lead by a CIO and made up of approximately 50 people, ICT at Z provides technology services for all of Z, including support for all infrastructure and most business applications. In addition they provide programme management and project delivery capability for all projects and cyber and information security falls within the ICT mandate.

With oil as a primary product Z is sensitive to both global and local pressures to reduce carbon emissions and lower environmental impacts. They have been looking at ways to ensure business sustainability by investigating product alternatives to fossil fuel (Z Energy, 2016). Z has been vocal in their commitment to development and achievement of their sustainability strategy.

Using channels including their annual report and social media, Z asserts they are in a "unique position to go from being part of the problem to being at the heart of the solution of sustainability in New Zealand" (Z Energy, 2015). To reinforce this assertion, sustainability is included in their business strategy.

2.4 Global drivers: Climate change – Greenhouse Effect

Over 97% of published researchers agree that the earth is warming. This phenomenon is called climate change and scientific institutions around the world are in agreement that it is caused by human activities (Earth Science Communications Team at NASA's Jet Propulsion Laboratory, 2016).

Climate change is caused by an effect known as the 'Greenhouse Effect'. This describes the warming of the earth's surface which occurs as a result of substances such as carbon dioxide letting the sun's energy through to the ground but impeding the passage of energy from the earth back into space (NIWA, 2016). "Carbon dioxide is the primary gas emitted through human activities" (United States Environmental Protection Agency, 2016).

"Uncontrolled human activities since the industrial revolution have brought the planet up to a level that the amount of emissions and the magnitude of the global environmental impact are indigestible" (Duffey & Dincer, 2010).

Climate change can be illustrated using global temperature statistics. Figure 1 illustrates the increase of global temperatures since 1880.

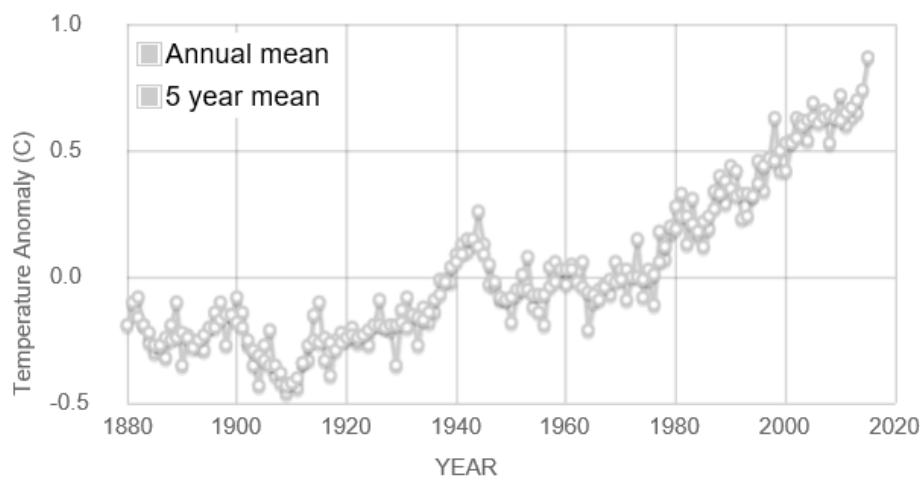


Figure 1: Global Land Ocean Temperature Index. (NASA's Goddard Institute for Space Studies , 2016)

Climate change is causing global waters to warm up and expand. This causes polar ice sheets and glaciers to melt which in turn raises sea levels and causes flooding and erosion of low lying areas. Extreme weather events such as heavy rain is causing water quality issues; drought and heat waves are becoming more common leading to forest fires and heat related deaths. These

types of weather lead to health issues caused by water borne illnesses. Poor and developing countries are heavily affected given that they depend highly on the natural environment for many resources. (European Commission on Climate Action, 2016).

Human activities are the significant contributing factor to climate change through carbon emissions. Not only are carbon emissions damaging, but the potential to reverse the damage caused by emissions is of major concern. Even after emissions stop, the change to the climate caused by the emissions is largely irreversible for 1,000 years (Solomon, Plattner, Knutti, & Friedlingstein, 2008).

Popular websites lead with headlines:

“An Arctic without ice, no more koala bears, and extreme droughts” (MSNBC, 2015)

“From children to the elderly, every American is vulnerable to the health impacts associated with climate change, now and in the future” (Elite Daily, 2016)

“The world is getting warmer and that’s already causing disasters that will devastate lives and cost hundreds of billions of dollars” (Business Insider, 2014)

“Stop climate change: Climate change is real. We're seeing the effects all around us - polar ice melting, sea level rising and extreme weather events. If we want to reduce the impact of climate change and have reliable energy sources, we must make changes, at a government and individual level” (Greenpeace, 2016)

2.5 Global drivers: Climate change – The Fuel Industry

Headlines about the fuel industry claim major financial losses for the oil industry are coming as government regulations alongside efforts to reduce the consumption of fossil fuels will cause oil companies to leave fuel in the ground as demand diminishes.

“Fossil Fuel Industry Risks Losing \$33 Trillion to Climate Change” (Bloomberg, 2016)

News articles discuss the realisation that unless demand for fossil fuels reduce, supply will continue. They assert that the real issue to be addressed is how humans wean off their need for oil and other fossil fuels and find a way to use cleaner energy sources.

“Protect our climate’ was the rallying cry heard across New York City yesterday, but the underlying message really was ‘stop using fossil fuels” (Forbes, 2014).

The issue of climate change is now so compelling that 150 world leaders met at COP21 (Conference of Parties) in Paris 2015 to develop a legally binding agreement to take action to avoid dangerous climate change. Known as the Paris Agreement and adopted by 195 countries, the agreement includes a long term goal to hold the increase in global temperature average to below 2°C, an aim to limit the increase in temperature to 1.5°C and for global emissions to peak and then rapidly reduce shortly thereafter (UNEP Climate Action, 2015).

The signing of this agreement will have major ramifications for oil companies. In order to keep the rise in temperatures to two degrees, the use of fossil fuels in the energy mix needs to reduce from the current amount of 77% to 60% by 2040. The term ‘Nodding Donkeys’ (shown in figure 2) used to refer to oil pumps is now also used to refer to oil company bosses and their response to the subject of climate change:

“Every so often they put their heads up and survey the future, only to bury them again”.
(The Economist, 2015).



Figure 2: Nodding donkeys (The Economist, 2015)

This attention to the impact of fossil fuels on climate change, the inextricable link between oil companies and fossil fuels, combined with the forecast continued reduction in demand and resulting low prices is causing upstream oil exploration projects to be deferred.

“The worldwide supply and demand imbalance has sent commodity prices from above \$100/bbl to nearly \$30 within about a year and a half. In turn, companies feeling the pain of tanking profits are re-evaluating break-evens and seeking cost savings. The result, as the report confirms, is that some fail to see reason in doling out dollars for new projects at this time”. (Hart Energy, 2016)

This combination of factors is causing downstream oil companies like Z that are not tied to a particular fuel source to position themselves as a transport fuels company as opposed to being an oil company.

Mark Beaufort, CEO of Z Energy says **“you have companies like us that are agnostic to the transport fuel that we sell and have less money tied up in big long standing investments and are much more able to be more market responsive and resource responsive”.**

2.6 Global drivers: Climate change – New Zealand context

In New Zealand the Ministry for the Environment advises the government on matters related to the environment and has developed policies and strategies that encourage New Zealand prosperity without compromising the environment. The Ministry has identified likely impacts of climate change on New Zealand. These include increased temperatures, more extreme weather events and negative impacts on health such as cold and flu illnesses.

Aligned with COP21, the Ministry has developed targets to reduce environmental impact over the coming 35 years (The Ministry for the Environment, 2016). These targets have resulted in policies that include initiatives to reduce greenhouse gas emissions such as the Emissions Trading Scheme (ETS). The Kyoto Protocol, which is the international treaty to support the reduction of greenhouse gas emissions, has meant that countries including New Zealand that are signed up to the protocol have implemented their own ETS schemes. These schemes impose a liability on industries such as the downstream fuel industry (Ministry for the Environment, 2014) which is, in turn, recovered from consumers.

The New Zealand Energy Trading Scheme requires businesses that bring fossil fuel into New Zealand to purchase a New Zealand Unit to match the emissions from the fuel. Consistent with the objective of the scheme, this has created certain changes in consumer behaviour and incentivised industry to invest in low carbon solutions. The New Zealand scheme aligns with global emissions trading schemes operated in other countries signed up to the Kyoto agreement.

The focus of the Ministry for Environment aligns with the goals of the New Zealand Sustainable Business Council (SBC) of which Z is a member. The SBS is an organisation that promotes business collaboration to create a sustainable future for New Zealand. As members of the SBC, Z is required to commit to sustainable practices, including reporting on progress in environmental, social and economic performance (Sustainable Business Council, 2016).

It is clear that environmental demands are adding complexity to organisations operating within the oil industry. They are required to participate and grow expertise in energy trading schemes, further complicating an already complicated supply change. This, accompanied by reports claiming that the oil industry is troubled and amidst transformation as a result of reduced demand and a vast drop in oil prices means that organisations need to quickly determine how they stay afloat in the changing environment and respond to ever increasing environmental pressures (PWC, 2016).

That the oil industry is transforming and is claimed by some to be a dying industry where access to alternative fuel technologies is lessening the grip of oil (The Economist, 2003) , is summarised effectively in a quote by former Saudi Arabian oil minister, in 2000, who said “The Stone Age did not end for lack of stone, and the Oil Age will end long before the world runs out of oil”.

2.7 The Z case study - strategic alignment and maturity of practices

Z is faced with a challenging issue. On one hand they are committed to operating an environmentally sustainable business. On the other hand they operate in an industry where the primary product has significant negative impacts on the environment.

In order to examine this problem, this case study reviews Z through two lenses. Firstly the alignment between organisation and information strategies in relation to the sustainability strategy will be assessed with the use of the Information Systems Strategy Triangle (Pearlson & Saunders, 2013).

Then the maturity of the ICT practices will be evaluated using the Green IT Maturity Model (Park, Eo, & Lee, 2012). This will provide an indication of whether the practices are sufficiently mature to support the sustainability goals.

3 Introduction to Analysis

3.1 Case study objective

This case study aims to review:

1. The alignment between the Z business sustainability strategy and the organisation and information strategies to evaluate if they are complementary and in alignment, and,
2. The maturity of the ICT practices at Z to evaluate if they are well placed to support the corporate sustainability goals.

In order to successfully deliver on their sustainability goals, Z should ensure they have alignment between all three strategies and furthermore, the organisation and information strategies should be designed to complement the business strategy. Z should ensure that business units have a good understanding of the sustainability goals and their role in achieving them, and that the business units themselves operate using sustainable practices.

The link between business, organisation and information strategies will be modelled using the IS Strategy Triangle (Pearlson & Saunders, 2013). This will demonstrate that the maturity of the sustainable ICT practices impact on the successful achievement of the corporate sustainability goals.

The ICT practices at Z will be measured against the Green IT Maturity Model (Park, Eo, & Lee, 2012) to provide a view of the level of maturity. The maturity level should be sufficient to support the achievement of the sustainability goals.

The Green IT Maturity Model (Park, Eo, & Lee, 2012) has been modified and an additional measure added to determine if a supporting ICT sustainability strategy exists. This measure was obtained from a separate ICT sustainability maturity model, 'A Capability Framework for Sustainable Information, Communication and Technology' (Donnellan, Sheridan, & Curry, 2011). This specific measure was selected to evaluate the existence and/or maturity of an ICT sustainability strategy to provide a full picture of ICT sustainability activities, from strategy to operational processes.

3.2 Strategic alignment: The recipe for success

Z operates using a business strategy which represents input from all business units. The reason for this is that each business unit should be able to identify alignment between their activities and company objectives. This approach to strategy aligns with the principle founded in research by Pearlson & Saunders (2013), who describe successful firms as “those with a business strategy that drives their organisational and information strategy” (Pearlson & Saunders, 2013, p. 24). This aligns with other research findings that business strategies respond to different information strategies. When developing an information strategy the business goals of the organisation should be well known and understood (Martinez-Simarroa, Devece, & Llopis-Albert, 2015). Research also acknowledges the move of information technology into a strategic role within organisations and asserts that in order for organisations to remain competitive they must ensure alignment between their information and business strategies (Benkhayat , El Manouar, & Sadok , 2015).

Pearlson & Saunders (2013) developed the IS Strategy Triangle. They assert that business strategy should drive organisational and information strategies and the three strategies must be carefully balanced, and the organisational and information strategies must deliberately complement the business strategy. Based on this model, it can be inferred that in order to achieve their sustainability (business) strategy, Z must have supporting organisational and information strategies.

The IS Strategy Triangle will be used to analyse and assess the alignment between the three strategies. A review of ICT sustainability strategy will identify if aligning business and organisation strategies exist. This will highlight areas of convergence and/or misalignment between strategies.

3.3 Sustainability and ICT

Researchers agree that ICT contributes 2-3% of total global carbon emissions (Australian Computer Society, 2012; Gartner, 2007; Dedrick, 2010; Molla, 2009; Donnellan, Sheridan, & Curry, 2011). This is predicted to increase to 4% by 2020 (Australian Computer Society, 2012).

As a sector, ICT is fast growing and while a part of the emission problem it can also contribute solutions to reduce emissions in other sectors such as travel and transport (Malmodin, Moberg, Lunden, Finnveden , & Lövehagen, 2010).

ICT can be used to solve some of the factors contributing to climate change. Kramers, Höjer, Lövehagen, & Wangel, (2014) discuss how ICT can support the development of Smart Cities by providing low energy solutions. They recommend a review of all activities within cities that require energy and propose a framework for identifying opportunities and areas where technology solutions can reduce energy.

Technology is viewed as one of the solution pillars for combating climate change. The resolution is seen to lie in a solution that involves technology research and development, creation of emission standards and incentives and a means for implementation (Rajan, 2006) .

ICT creates environmental impact in three main areas, production of equipment, use throughout its life and disposal of equipment (Murugesan, 2009). In order to reduce the impact ICT has on the environment, attention must be given to the practices that make up the ICT footprint. Manufacturing of computer componentry consumes raw materials and electricity, use of technology consumes electricity in the operation of computer, monitors and other equipment and also through energy use for cooling data centres and computers contain toxic componentry and these are often disposed of in landfills (Murugesan, 2009).

In order to reduce the environmental effects of ICT, researchers agree that we must look at ways to provide more environmentally friendly ICT solutions. Defined as ‘Green IT’ this includes energy conservation and cost reduction of ICT production and usage (Bokolo & Mazlina, 2016; Park, Eo, & Lee, 2012; Dedrick, 2010).

Duffey & Dincer (2010) suggest that better use could be made of resources and systems and applications could be made more efficient and environmentally friendly. Other studies propose adoption of maturity models. These are used to evaluate the maturity of ICT practices and targets set to improve maturity. The outcome is a reduction of environmental impact (Donnellan, Sheridan, & Curry, 2011; Park, Eo, & Lee, 2012; Murugesan, 2009; Gartner, 2013).

Recent research into Green IT looks at how initiatives for sustainability are being developed into national policies and programs and how the use of ICT is a major contributor to progression towards a more sustainable society. Education is seen as important to ensure further development around sustainability concerns and a Master's degree has been developed combining advanced ICT with environmental awareness (Klimovaa, et al., 2016). Other recent research has investigated if consumers are willing to pay more for Green ICT devices if the toxic componentry used in manufacturing is limited. It found that consumers that have greater environmental beliefs and existing environmentally friendly practices are more likely to pay a premium for devices. Research also suggests that education of the benefits of pro-environmental behaviour can help increase support for the implementation of Green IT policies (Milovantseva, 2016).

In order to determine the level of sustainability maturity in ICT practices, a number of frameworks and models exist which can be used to measure specific areas. In determining which framework would be most appropriate for Z, three frameworks were analysed:

1. A Capability Maturity Framework for Sustainable ICT (SICT-CMF) (Donnellan, Sheridan, & Curry, 2011). This is designed to measure the maturity of sustainability in ICT and improve capability. A particular strength of this framework is that it considers strategy and planning as an indicator of maturity which is important if ICT is to lead or at least enable changes in business strategy. However, it does not go into sufficient detail of ICT processes to enable accurate measurement of maturity level.
2. The Green IT Maturity Model (Park, Eo, & Lee, 2012). The researchers designed this model after assessing a number of maturity models and identifying strengths and weaknesses. The resulting model has defined stages of maturity very precisely to enable the measures to be evaluated accurately. It is made up of five categories designed to assess and improve ICT sustainability capability. It is used to assess Green IT maturity by providing a set of guidelines for establishing a target goal for each category and works on the premise that when goals are achieved, maturity should have improved. This framework can be used to determine the current maturity level of sustainability in ICT and provide a path to improve, if necessary. However, it does not incorporate evidence of ICT supporting business strategy as a driver for maturity.
3. The third model analysed was Accenture's Green Maturity Model (Accenture, 2008). This is part of a Green Technology suite of tools developed to assess sustainable IT maturity, calculate impacts of initiatives and provides benchmarking against industry

peers. While comprehensive, this model is labour intensive to use as it requires responses to 300 detailed questions.

The model selected to assess the sustainability maturity of the ICT practices at Z is the Green IT Maturity Model (Park, Eo, & Lee, 2012) . For the purposes of this case study, the model has been updated to include a measure of ‘Supporting Strategy’. This was taken from the SICT-CMF (Donnellan, Sheridan, & Curry, 2011).

The updated model is shown in table 1.

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Supporting strategy	No sustainable ICT strategy exists	Initial: SICT is ad hoc; there's little understanding of the subject and few or no related policies. Accountabilities for SICT aren't defined, and SICT isn't considered in the systems life cycle.	Basic: There's a limited SICT strategy with associated execution plans. It's largely reactive and lacks consistency. There's an increasing awareness of the subject, but accountability isn't clearly established. Some policies might exist but are adopted inconsistently	Intermediate: A SICT strategy exists with associated plans and priorities. The organization has developed capabilities and skills and encourages individuals to contribute to sustainability programs. The organization includes SICT across the full systems life cycle, and it tracks targets and metrics on an individual project basis.	Advanced: Sustainability is a core component of the IT and business planning life cycles. IT and business jointly drive programs and progress. The organization recognizes SICT as a significant contributor to its sustainability strategy. It aligns business and SICT metrics to achieve success across the enterprise. It also designs policies to enable the achievement of best practices	Optimizing: The organization employs SICT practices across the extended enterprise to include customers, suppliers, and partners. The industry recognizes the organization as a sustainability leader and uses its SICT practices to drive industry standards. The organization recognizes SICT as a key factor in driving sustainability as a competitive differentiator
A strategy to guide Sustainable ICT practices						
Work Practises	No related initiative	There is a plan for setting up a telecommuting support system	There is a telecommuting support system, which may be used with approval of its manager, but many are unaware of its existence	There is a telecommuting support system, which may be used with approval of its manager, and employees are well informed about its existence	Telecommuting is actively encouraged by the responsible officer	Telecommuting is actively encouraged by the responsible officer
Encouragement of and support for telecommuting						
Office Environment	No printing and toner saving policy and plan are available	A printing and toner saving policy and plan have been established	A printing and toner saving policy has been implemented	A printing and toner saving solution is available but no consumption management system is available	The department's consumption amount is being managed to reduce the use of printing and toner	An individual's consumption is managed, and a saving solution has been introduced
Use of printing and toner saving solutions						

Data Centre						
Use of a server virtualization solution	Separate servers are operated for each application system	Server integration and a virtualization solution are being planned	Servers have been integrated physically for server virtualization	Virtualization technology has been partially introduced	Most servers are integrated, and operated via the application of virtualization technology	Server integration and virtualization have been implemented, and are improved continuously under the policy/management system
Procurement						
Use of energy efficiency-certified IT devices	Power efficiency is not considered at all when purchasing IT assets	Power efficiency is considered when purchasing IT assets	There is a regulation that mandates power efficiency in the IT asset purchase guideline	Power efficiency is specified in the request for proposal when placing an order	Power efficiency is the top priority item to consider, when purchasing IT assets	Only lower power consumption and high efficiency IT assets are purchased
Waste Management						
Control of toxic or harmful substances in items disposed of or sold off	No eco-friendly IT asset disposal regulation is available	An eco-friendly IT asset disposal regulation has been prepared	There are eco-friendly IT asset disposal regulations but no implementation result is available	Eco-friendly IT asset disposal is performed on a limited basis	Eco-friendly IT asset disposal is performed universally	Eco-friendly IT asset disposal results are managed throughout the company

Table 1: Updated maturity assessment tool based on the Green IT Maturity Model (Park, Eo, & Lee, 2012) with ‘Supporting Strategy’ taken from the SICT-CMF (Donnellan, Sheridan, & Curry, 2011).

4 Analysis

4.1 Approach to data collection

The methodology used to gather data to evaluate the alignment of strategies and maturity of ICT practices was a combination of semi structured face to face interviews with selected Z employees and analysis of Z strategy documents, academic and practitioner research and frameworks. The objective of the interviews was to gather qualitative data from employees familiar with the topic.

4.2 Face to face interviews and supporting data

The selected interview technique aligned with the approach discussed by Schultze & Avital (2011) in that, the topic under discussion was of common interest to both parties; interviewees and researcher, and the questions were grouped in a deliberate way to guide the interviewee from a broad view of sustainability at Z, narrowing to their own role, experience and reflections. This achieved the interview objective of gathering detail rich responses.

The interview data aligned with interview outcomes described by Zhang & Wildemuth (2009), that each interview would provide qualitative data by virtue of the fact that information from participants described their view of the world.

Z sustainability strategy and other associated company information including the detailed sustainability stands, video content and annual report information was obtained from Z's website.

4.3 Interviewee selection and interviews

Interview candidate selection was completed in consultation with Z managers, and based on the potential of the role to contribute to strategy creation or involvement in ICT processes deemed to impact the maturity of sustainability. Eight suitable participants were approached and provided with case study information and a consent form. Each participant signed the consent form and participated voluntarily. As the researcher is employed as Chief Information Officer at Z it was made clear in the participant information form and at the commencement of each interview that the case study was undertaken from a research perspective and the researcher participating in the role of student. Confidentiality was assured to encourage honest and open responses and interview data was not shared amongst participants. Interviewee

names have been changed in an effort to protect their identity but they are aware they may be identified through their role.

Participants are all Z employees and pseudonyms have been given to each as shown in table 2:

Pseudonym	Role title
Mark Beaufort	Chief Executive Officer
Emma Wyatt	Corporate Sustainability Manager
Sierra	Three People and Culture Business Partners
Carly Nelson	Chief Information Officer
Rachel	ICT Operations Manager
Anthony	ICT Infrastructure Manager
Jackson	ICT Technical Delivery Manager

Table 2: Z employees and pseudonyms

Each interview lasted 20 – 35 minutes. Dependent upon role, each interviewee was asked a series of questions. The master list of all questions is shown in Appendix 3.

Each interview was digitally recorded then transcribed by the researcher. A transcription of the interview was provided to the participant who had the opportunity to amend any recorded information, volunteer further insights or information. Participants were given the option of withdrawing from the research at any time during the process, though none did.

4.4 Limitations and data quality

A limitation of this research is the number of people interviewed. Eight interviewees were deliberately selected to obtain specific information relevant to this case study. Eight was a manageable number to provide sufficient data for this case study. This opens the research up to the possibility that findings and recommendations may differ if the research had a larger sample size.

Information quality relied on interviewee subject matter knowledge of sustainability at Z. It is possible that responses may have been provided in an effort to answer every question when actual knowledge may have been unreliable or missing altogether.

4.5 Data organisation and evaluation

Interview questions were informed by the IS Strategy Triangle (Pearlson & Saunders, 2013) and the adapted Green IT Maturity Model (Park, Eo, & Lee, 2012). Questions were divided

into sections. The first set of questions was designed to understand and analyse the alignment between business, organisation and information strategies. The next set examined participant knowledge of ICT practices detailed in the Green IT Maturity Model. The interview concluded with miscellaneous questions designed to gain insights into the participant's knowledge of Z resources available to assist with achievement of sustainability goals and to reveal any barriers that interviewees may be aware of or have experienced.

A master list of the interview questions and the responses was compiled into a spreadsheet. Each question along with all responses to the specific question was captured in one row which enabled the researcher to review each question and all responses with ease.

4.6 Qualitative analysis

The data was analysed using the inductive reasoning style described by Zhang & Wildemuth (2009). This entailed a detailed review of each piece of data and constant comparison with other interview data. Through this process, data with similar themes were identified and coded and emerging themes became apparent. The most surprising of these was that while employees were able to quote Z sustainability goals and spoke enthusiastically, leaving no doubt that they supported them, the majority were unable to explain their role in achieving them. Further analysis of the data continued to reflect and confirm this gap.

The researcher evaluated the alignment between the business, organisational and information strategies. Pearson & Saunders (2013) demonstrate the importance of alignment by applying the framework to the 2010 BP Deepwater Horizon oil spill. They identified that a misalignment between the business strategy, information systems and organisational procedures contributed to the flawed safety rig design found to be the cause of the spill. Furthermore, this application of the framework highlighted the importance of senior management understanding ICT and the impacts of technology infrastructure on business processes and also the importance of personnel policies that ensure all employees follow procedures, absent in the example.

4.7 Review of strategic alignment using the IS Strategy Triangle

Using a two-step process, the alignment of strategies at Z was evaluated.

Through analysis of the data gathered from interviews and official company information, a conceptual model was built to demonstrate how Z intended to achieve alignment of the strategies.

Figure 3 demonstrates the required alignment between business, organisational and information strategies to support the achievement of the sustainability goals at Z using the IS Strategy Triangle (Pearlson & Saunders, 2013).



Figure 3: Intended strategic alignment at Z using IS Strategy Triangle (Pearlson & Saunders, 2013)

In order to determine the level of alignment between the three strategies, the answers to key questions from the framework were used to evaluate the data.

When asked “is Z clear on where it seeks to go and how it expects to get there” interviewees were able to quote the sustainability stands. Sierra from the People and Culture team talked about **“the idea of having less waste in your everyday work and also in the cafe environment. I've noticed things like some new bins...”**

The ICT Operations Manager specified aims of the strategy as being **“around the environment and the acknowledgement that we do have a large carbon footprint and therefore there are things that we need to do in other areas of sustainability to help with our goal of being a good corporate citizen of NZ, being a world class kiwi company”**.

These comments and other similar responses resulted in an evaluation that Z has a well-articulated sustainability strategy in place. Plans on how to deliver the strategy are defined and frequently measured. The strategy is communicated to a wide stakeholder group.

The next set of questions assessed how Z is organised to achieve the sustainability goals, and to determine if any supporting procedures exist. The interview data evidenced that a sustainability team is in place. Interviewees varied on where they thought responsibility for sustainability resides though the majority of interviewees said that responsibility for successful delivery of the strategy is shared. Comments included **“I know we’ve got some roles that look after sustainability... I think the way Z is set up that probably everyone is responsible”**, others said **“I think it is everyone’s role. Everyone can play a part”**. One interviewee said **“I would say everyone is responsible”**.

All interviewees had knowledge of the corporate sustainability team and awareness of procedures within the team to support the achievement of the goals. Outside of the corporate sustainability team, clarity over how other roles within Z contribute to achievement of the sustainability goals and evidence of supporting procedures is absent.

When asked about the responsibility for sustainability decision making, the Corporate Sustainability Manager said **“It sits with the Sustainability Manager and the General Manager of the Corporate Business Unit”**

The CEO said that **“Sustainability is a strategic issue so the board should be spending time examining it from a governance perspective, is it the right strategy, are we doing the right things, are we taking too much or not enough risk”**.

Other interviewees said that the way the strategy is communicated makes everybody responsible in some way, though many had difficulty in describing the actual responsibility. Comments included **“Well I know we've got some actual roles that look after sustainability... I think people feel that they are responsible but I just don't know if people know what they need to be doing”**, and, **“I don't know the people as such so but I believe there is a team. There are a couple of people that sit down by P&C. That's all I know”**.

When asked about procedures within their roles and how they would know if they were doing a good job supporting the strategy, the only interviewee who was able to describe what this would look like was the CEO who answered on behalf of Z and said **“there is hard core**

quantitative analysis. We said we'd do x by y - was that done or not? You get the qualitative feedback through things like your brand surveys, employee engagement surveys, through reputation surveys”, other interviewees said “I don't know if I would know if I've done a good job. There is nothing - a tick box that I've done or haven't done” and, “I don't know if I could actually ever see it”.

As far as interviewees knew, there was no reference to sustainability in any job description outside of the sustainability team.

The next set of questions looked at the technology and processes needed to support the sustainability goals. When asked if an ICT sustainability strategy is in place, interviewees became pensive. After consideration the CEO said **“It's a bloody good question. I'm not sure whether we have one or not”**. The ICT team appeared perplexed when answering and said **“No. I'd love to know more”** and **“No, I've never seen one”**.

When asked if a sustainability strategy informs technology decisions the ICT Managers said **“No technology other than FollowMe Printing - that was a big one”** and **“I can't answer that. I don't know”**.

Like other interviewees, the ICT team are aware of the sustainability strategy and goals. Absent was any information strategy referencing sustainability. In summary, the theme of the responses is that ICT interviewees are knowledgeable and supportive of the Z stance on sustainability but became disconcerted when it became obvious during the interview that while their roles were able to contribute to the achievement of sustainability goals through decision making and actions, they didn't know what was expected of them or what to do about it.

The analysis found that:

- Good alignment between the organisational and the sustainability strategy exists. Structures and procedures are in place.
- No alignment was found between the information and sustainability strategies. No information strategy referencing sustainability was evident. The technology impact on sustainability is not understood and little evidence of consideration for sustainability in decision making is seen.
- No alignment between the information and organisational strategies is evidenced. Role responsibility for sustainability in ICT is not clear and procedures to support the sustainability strategy are absent.

When overlaying these findings on the IS Strategy Triangle (Pearlson & Saunders, 2013) , Figure 4 demonstrates the misalignment between strategies (Finding one).

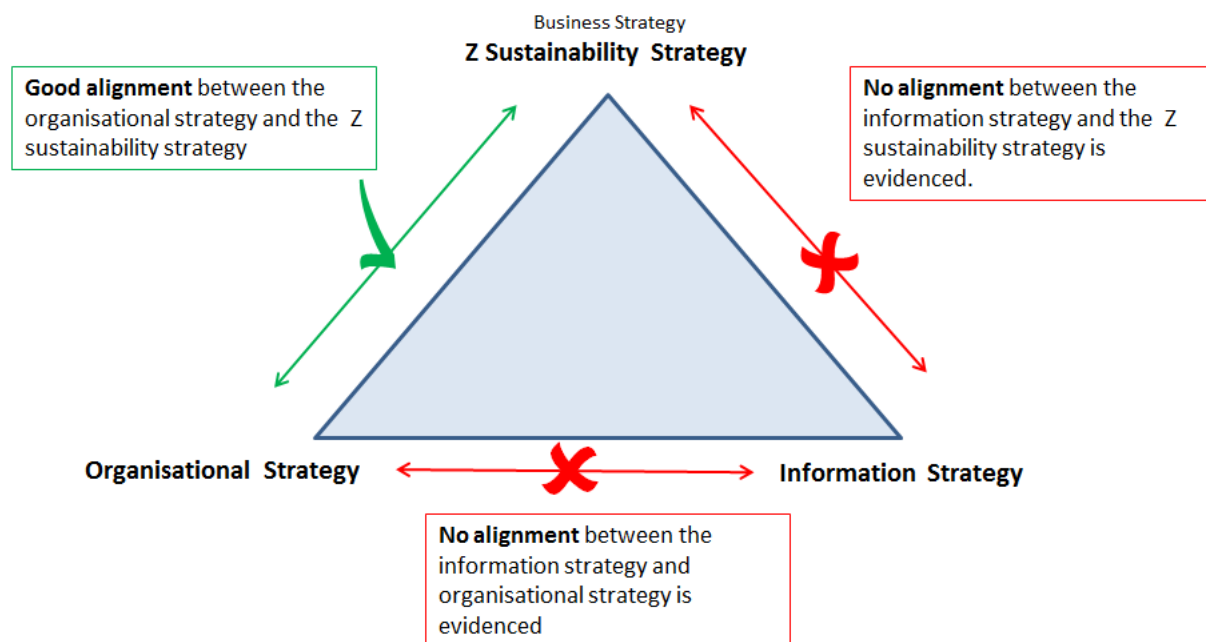


Figure 4: Misalignment between strategies at Z using IS Strategy Triangle (Pearlson & Saunders, 2013)

4.8 Review of ICT practices using the Green IT Maturity Model

Next the data was used to measure the ICT practices against the Green IT Maturity Model (Park, Eo, & Lee, 2012). To work with the entire data set, thematic codes were used to categorise the data.

4.9 Applying the Green IT Maturity Model

The selected framework recommends that in order to improve the maturity of sustainability practices within ICT the current state must first be assessed. The intent of this case study is to measure the current maturity of ICT practices to evaluate if they support the corporate sustainability goals. As the sustainability goals are specific to Z it was critical to select a framework that enabled customisation of measures to areas of technology likely to have the most impact on Z's sustainability goals. In developing the framework, the researchers identified 64 indicators of ICT sustainability maturity including use of efficiency-certified IT devices and user of a server virtualisation solution. They then defined six stages of maturity, shown in figure 5 which can be used to determine maturity stages for any/all of the indicators. In order to measure the maturity of the indicator, maturity stages should be developed. This flexibility enables the framework to remain current as technology, work practices and priorities change. In addition the model can be extended to include additional indicators relevant to Z. In order to apply consistency when measuring maturity, Z should select and commit to a Green IT maturity model where they can identify goals and measure the progress to increased maturity (Finding two). This is likely to be supported by the new CIO who has discussed the use of maturity frameworks as a way to increase the maturity of Green ICT practices.

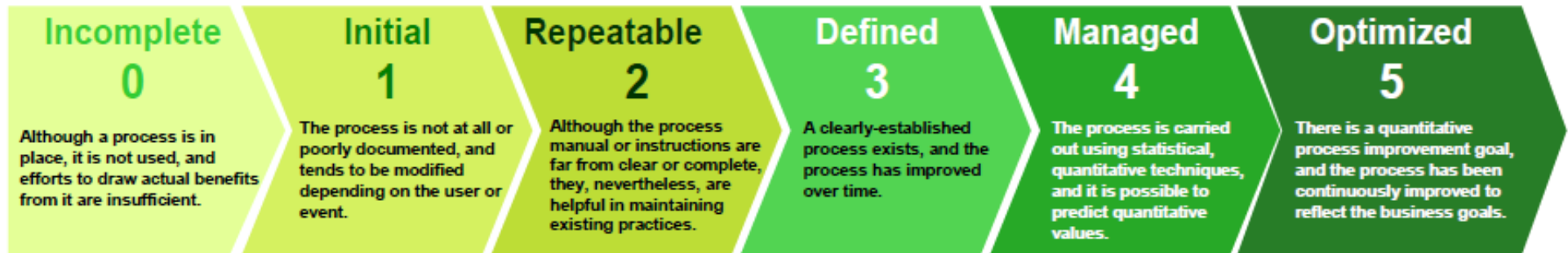


Figure 5: Six stages of maturity (Park, Eo, & Lee, 2012)

4.10 Approach to evaluation

In order to accurately evaluate the maturity of the six indicators deemed most valid for Z as a result of having the highest impact on the sustainability strategy, the interview questions were targeted to gain detailed information of procedures in place. Data for each indicator was collated and compared to determine the appropriate measure, cohesive across all relevant data. In order to finalise the measure, the data was interpreted. A quantitative tool was not utilised. The data was used to evaluate which maturity measure most accurately represents the current maturity level at Z. This was repeated for each maturity measure.

4.11 Maturity Assessment

ICT strategy for sustainability

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Supporting strategy						
A strategy to guide Sustainable ICT practices	No sustainable ICT strategy exists	Initial: SICT is ad hoc; there's little understanding of the subject and few or no related policies. Accountabilities for SICT aren't defined, and SICT isn't considered in the systems life cycle.	Basic: There's a limited SICT strategy with associated execution plans. It's largely reactive and lacks consistency. There's an increasing awareness of the subject, but accountability isn't clearly established. Some policies might exist but are adopted inconsistently	Intermediate: A SICT strategy exists with associated plans and priorities. The organization has developed capabilities and skills and encourages individuals to contribute to sustainability programs. The organization includes SICT across the full systems life cycle, and it tracks targets and metrics on an individual project basis.	Advanced: Sustainability is a core component of the IT and business planning life cycles. IT and business jointly drive programs and progress. The organization recognizes SICT as a significant contributor to its sustainability strategy. It aligns business and SICT metrics to achieve success across the enterprise. It also designs policies to enable the achievement of best practices	Optimizing: The organization employs SICT practices across the extended enterprise to include customers, suppliers, and partners. The industry recognizes the organization as a sustainability leader and uses its SICT practices to drive industry standards. The organization recognizes SICT as a key factor in driving sustainability as a competitive differentiator

Maturity evaluation: **Zero**

Interviewees could see the value of an ICT sustainability strategy but confirmed that one does not exist (Finding three). Mark said **“I'm not sure whether we do this or not”** and ICT interviewees concerned at the lack of and ICT strategy were keen to know more. They confirmed they had not seen or heard of one.

Work practices – Telecommuting

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Work Practises				There is a telecommuting support system, which may be used with approval of its manager, and employees are well informed about its existence		
Encouragement of and support for telecommuting	No related initiative	There is a plan for setting up a telecommuting support system	There is a telecommuting support system, which may be used with approval of its manager, but many are unaware of its existence	There is a telecommuting support system, which may be used with approval of its manager, and employees are well informed about its existence	Telecommuting is actively encouraged by the responsible officer	Telecommuting is actively encouraged by the responsible officer, and incentives are offered in the form of rewards for those who do telecommute

Maturity evaluation: **Three**

Interviewees had a lot of knowledge about telecommuting practices at Z. All named at least two of the telecommuting practices recommended by the framework including videoconferencing and technology enabling employees to work from home. They all shared examples of mobile working. Rachel said **“You don't need special permission to use it. It's used widely”** which was confirmed by Jackson, who, when asked about telecommuting said **“Yep, absolutely, what we have is quite good; our VPN solution is available for all users. It's big enough to handle the entire Z. Every single person has a laptop. We use VOIP. We've got mobile phones. So you can run everything you need to run remotely from the office”**. While widely available, there was no evidence of telecommuting being actively encouraged (Finding four).

Office environment – Printing and toner solutions

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Office Environment	No printing and toner saving policy and plan are available	A printing and toner saving policy and plan have been established	A printing and toner saving policy has been implemented	A printing and toner saving solution is available but no consumption management system is available	The department's consumption amount is being managed to reduce the use of printing and toner	An individual's consumption is managed, and a saving solution has been introduced
Use of printing and toner saving solutions						

Maturity evaluation: **One**

If using only a quantitative approach to data analysis the practice of saving on printer and toner solutions would score zero. However this case study is applying qualitative reasoning to interview data. While no formal plan for printing and toner saving exists at Z, every interviewee specifically mentioned the FollowMe print technology in use. FollowMe print technology provides functionality that means when a user clicks print, their print job is held on a server and released by the physical presence of user credentials at a printing device. This reduces paper and toner waste and provides users with a secure printing functionality. If the print job is not claimed within a few hours the job is deleted. At Z, all user settings default to FollowMe print, double sided, black and white output.

The existence of this technology has been considered and resulted in the score of one against this indicator. There is some maturity in work practices although Z could be managing this more actively (Finding five).

Consumption reporting and tracking information is thought to be available. Some of the interviewees knew that it existed and also knew that Z did not use it. Anthony said **“we can get the reports; I believe the capability is there. We could get the information if we wanted to”**.

Data Centre – Server virtualisation solution

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Data Centre						
Use of a server virtualization solution	Separate servers are operated for each application system	Server integration and a virtualization solution are being planned	Servers have been integrated physically for server virtualization	Virtualization technology has been partially introduced	Most servers are integrated, and operated via the application of virtualization technology	Server integration and virtualization have been implemented, and are improved continuously under the policy/management system

Maturity evaluation: **Four**

This objective of this indicator is for organisations to reduce the number of servers through efficient management of server usage. Z is mature in this area; **“Virtual unless you really prove otherwise”** is how the Z practice was described. **“The majority of the fleet is virtualised”**.

The only area of concern for this indicator which is likely to be as a result of the absence of a clear strategy is the comment **“I think that server virtualisation is a consideration rather than a priority for ICT - right environment, right solution for the system and if it came down to it my preference is to go yes we would virtualise”**. Z could manage this more actively (Finding six).

Procurement – Energy efficient devices

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Procurement	Power efficiency is not considered at all when purchasing IT assets	Power efficiency is considered when purchasing IT assets	There is a regulation that mandates power efficiency in the IT asset purchase guideline	Power efficiency is specified in the request for proposal when placing an order	Power efficiency is the top priority item to consider, when purchasing IT assets	Only lower power consumption and high efficiency IT assets are purchased
Use of energy efficiency-certified IT devices						

Maturity evaluation: **One**

Interviewees confirmed that power efficiency is considered when purchasing IT assets however they did not know if any guidelines for procurement existed. They were also unsure if they were empowered to prioritise energy efficiency over cost when purchasing (Finding seven). At Z procurement of IT assets is shared between Z employees and support partners. Interviewees said:

“I’ve heard around the office is that it is considered but it's not the be all and end all”.

“There is no requirement to look at efficiency when procuring assets from what I've seen. I don't think we'd ever not purchase something because of its power consumption”.

“We don't give suppliers that purchase on our behalf minimum requirements for power efficiency when selecting hardware”.

“We haven't given suppliers instructions on minimum standards we expect for hardware. We should set those standards and say that these are the standards that we want to operate within and give them that range and that way it makes it easier for the selection process as well”.

Waste management – Controlled disposal

Area and Detailed Indicator	Definition of Maturity Stages					
	0	1	2	3	4	5
Waste Management						
Control of toxic or harmful substances in items disposed of or sold off	No eco-friendly IT asset disposal regulation is available	An eco-friendly IT asset disposal regulation has been prepared	There are eco-friendly IT asset disposal regulations but no implementation result is available	Eco-friendly IT asset disposal is performed on a limited basis	Eco-friendly IT asset disposal is performed universally	Eco-friendly IT asset disposal results are managed throughout the company

Maturity evaluation: **Zero**

Interviewees thought that Z disposes of e-waste in an eco-friendly way but were not sure how (Finding eight). This is of concern as the ICT Infrastructure Manager responsible for asset disposal did not know what the process is. When asked how Z disposed of end of life assets interviewees said:

“Yes and no. Normally I would say yes, we pay to have our assets disposed of securely and in the best possible eco-friendly way but recently we had a little glitch”.

“I don't know the procedure to get rid of assets”.

“The policy isn't widely available”.

“We haven't given supplier instructions that we expect eco-friendly disposal but we picked them based on the fact that that was one of the things that they talked about doing. But we don't audit them to check that they do it”.

“No. I don't know that answer. I know that our vendors will dispose of our assets for us but I don't know what they do with them. I don't know where they go so I don't know that whole chain. I don't think we've told them that we expect eco-friendly disposal”.

“I know there are some options for recycling and reuse but I'm not aware of what that process is”.

4.12 Summary

4.12.1 Strategy alignment

A review of the data collected in relation to Z business, organisation and information strategies made it clear that while the sustainability strategy was apparent, it was not supported by organisational and information strategies. Furthermore, supporting procedures within ICT do not appear to exist.

The implication of this is that while the interviewees were keen to support sustainability they are not sure how to (Finding nine).

4.12.2 Maturity evaluation

The information collated to measure the maturity of the ICT sustainability practices provides a clear result. The level of maturity is low. This surfaced through interview comments which demonstrate a general lack of knowledge of what processes might exist, any authority ICT managers have to make decisions about sustainability and the perplexity of interviewees when discussing the absence of an information strategy with sustainability considerations (Finding ten).

A mean score of 1.8 across six indicators provides Z with a big opportunity to increase their maturity.

As a final check on the validity of the evaluation, two of the interviewees were shown the researchers interpretation of the maturity level to conduct a participant check of the results. They agreed with the results although they did think that the use of FollowMe print would have resulted in a higher score against the 'Printing and toner solutions' measure.

5 Recommendations and conclusions

Recommendations were developed to remediate the research findings. They are intended to provide convergence between the business sustainability strategy and the organisation and information strategies. They also aim to improve the maturity of the ICT practices.

5.1 Finding one: Develop and balance the strategies

Z should review the sustainability strategy and develop organisational and information strategies that complement it (Pearlson & Saunders, 2013). Each strategy component should consider the organisation and information requirements needed to achieve it. The organisational strategy should review the organisational structures and the supporting procedures and ensure clarity of role expectation between employees and the sustainability team. The information strategy should include a plan for providing information systems and services that support the sustainability strategy. Hardware, software networking and data requirements should be considered and a review of existing ICT practices such as procurement and e-waste disposal should be included.

Once developed, it is recommended that the strategies are communicated to relevant stakeholders. Information on the objectives of the sustainability strategy and definition of how these will be supported by the organisation and information strategies should be explicitly defined.

5.2 Finding two: Models and measures

5.2.1 Commit to the Green IT maturity model

There are a number of maturity models that Z could use to assess and benchmark maturity of sustainability in ICT. It is recommended that the CIO commit to the ongoing use of the Green IT Maturity Model (Park, Eo, & Lee, 2012) to track progress consistently. The model is flexible and can be easily adapted to the Z business by selecting indicators and developing maturity measures. It also provides a pathway for improvement.

5.2.2 Establish maturity goals

Based on the current assessment of maturity, Z should create a pathway for improvement by establishing goals for each of the indicators. It is recommended that interim goals are set and then once achieved, longer term goals.

Once goals are set, projects to achieve them should be identified and prioritised. From the assessment results, there are areas where the next step is obvious. To lift maturity, Z should perform the action to achieve the next level of maturity. For other areas, the increase in maturity needs to be higher.

Interim goals are recommended which align with the ‘SMART’ (specific, measurable, achievable, realistic, and timely) approach to goal setting. This will provide the team with achievable goals while lifting the maturity levels. Once the interim goals are met, goals for the next stage of maturity should then be defined.

Interim goals are detailed below:

5.3 Finding three: Implement a strategy to guide sustainable ICT practices

With a score of zero, recommended to increase to three, this requires the creation of a sustainable ICT strategy. Development and implementation of a strategy is fundamental to achieving the desired sustainable outcomes. A sustainability strategy in ICT will provide goals, guidelines and expectations to aid decisions and inform the creation and update of procedures.

5.4 Finding four: Encourage telecommuting

With a score of three, recommended to increase to four, this small increase requires the option of telecommuting which is already well known by staff, to be actively encouraged. The technology implemented by Z to enable remote working can handle the entire Z employee base working remotely and employees all have laptops and mobile phones. This maturity increase could be achieved through communications and employee education of telecommuting options.

5.5 Finding five: Manage printing and toner saving solutions

With a score of one, recommended to increase to three, this requires adoption of a printing and toner saving policy and enquiry into the consumption information available. The technology at Z provides this functionality and a policy should be developed to govern it. The connection between the print saving solution and the sustainability stand of ‘using less in our business’ demonstrates an explicit link to the sustainability goals.

5.6 Finding six: Management of server virtualisation

With a score of four, recommended to increase to five, this requires active management of server virtualisation. Some servers are virtualised at Z but this is not decreed. Assigning this responsibility to a specific role and developing a way to monitor and measure progress is likely to result in an increase in maturity. A requirement for server virtualisation should be included in the ICT Sustainability Strategy.

5.7 Finding seven: Implement guidelines for ICT asset procurement

With a score of one, recommended to increase to two, this requires regulations and minimum standards for power efficiency when ICT assets are purchased for, and by Z. This information should form part of instructions to suppliers when they are purchasing. Minimum sustainability standards should also be part of request-for-proposal requirements.

5.8 Finding eight: Implement guidelines for ICT asset disposal

With a score of zero, recommended to increase to four, this requires the biggest jump in maturity. Based on the fact that the current process is unknown and the potential for damage to Z's reputation if they were to dispose of assets in a way that damaged the environment, plans to increase the maturity of this indicator should be prioritised. Z employees should immediately find out how technology assets are being disposed of and implement a policy with supporting procedures. This information should be provided to suppliers. In addition, compliance to the policy should be measured.

5.9 Finding nine: Consider ICT as part of the solution

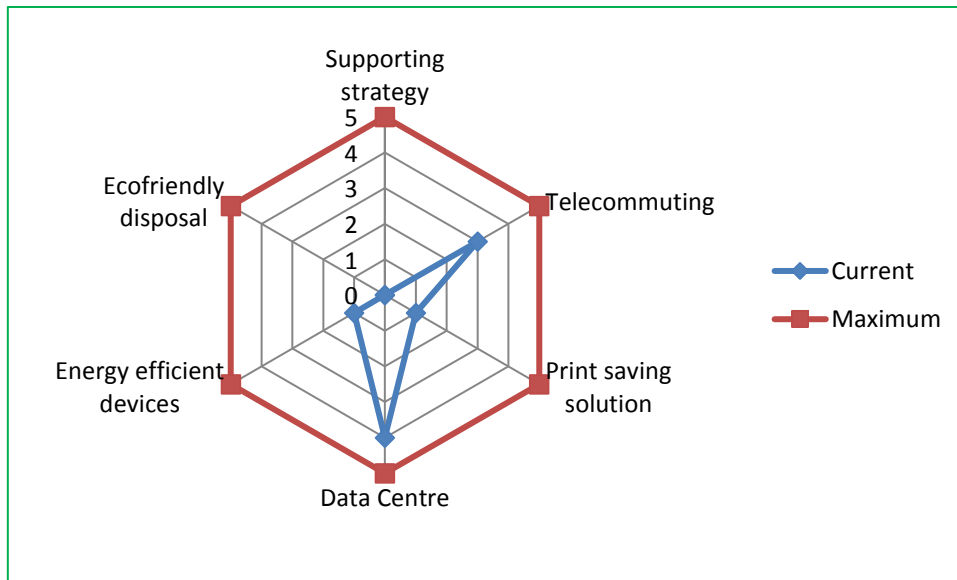
The sustainability team and the ICT team should develop ways to work together with the overall objective for ICT to contribute solutions to aid in the achievement of the sustainability goals. One way to begin would be to review the travel and associated emissions reporting and develop goals to be shared between the teams. This could include collaborative efforts to communicate the video conferencing solution and perhaps expand it.

5.10 Finding ten: Measure and communicate maturity of ICT sustainability

Maturity levels should be regularly measured and communicated. It is recommended that responsibility for ICT sustainability is built into job descriptions and responsibility for increasing maturity included in the company financial incentive scheme for selected roles. Maturity levels could be communicated through the use of a spider diagram which could display the current stage, improvements as they occur and the target state, as shown in figure 6.

ICT Sustainability Maturity

Current state



Interim target state

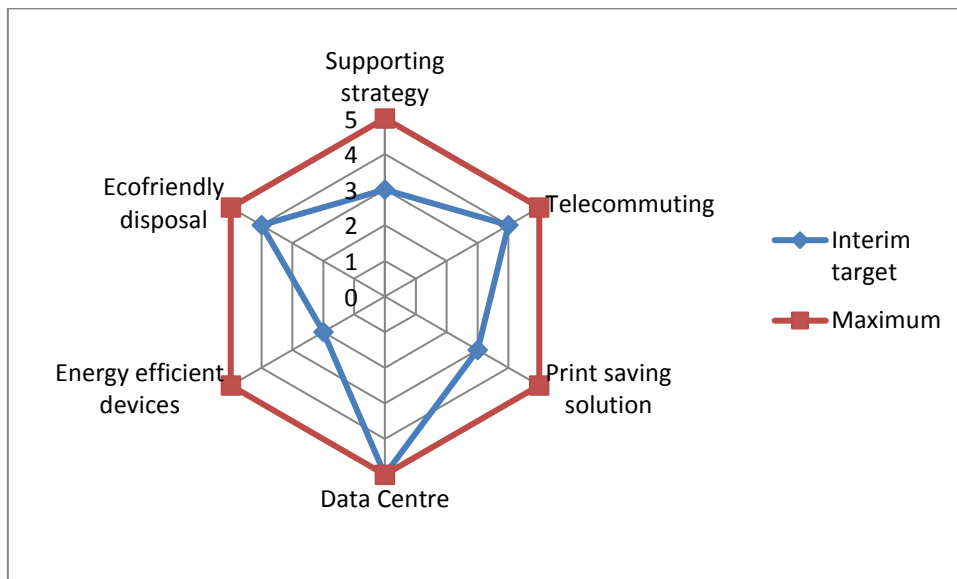


Figure 6: Current and interim maturity levels

5.11 Conclusion

Anthony and Rachel walked excitedly back to their desks, buzzing with ideas to talk to the team about. The meeting with the Carly and Emma had gone very well. Rachel and Anthony shared how enthusiastic they were about sustainability and also revealed that they had been feeling uneasy that it was not clear to them how they could contribute to the achievement of the goals. Emma was apologetic that expectations of how people could contribute to the goals had not been clear but she had plans to clear that up going forward.

Rachel talked about how technology could contribute to lowering energy consumption and Emma was eager to learn more. She was keen to work with the ICT team especially when they showed her the Green IT Maturity Model. Emma saw value in working in partnership with them as she now viewed them as a group that could provide solutions to help Z achieve the sustainability goals. They were already talking about quick wins that could be put in place with little to no cost. The group decided that the first thing to do was to put together a working group with interested people and then develop a plan of action to baseline the maturity level of ICT practices and work on lifting it.

All three left the meeting feeling optimistic about the future opportunities that this would open up for both teams.

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7 Appendices

7.1 Appendix 1 - Z Stand on sustainability

[Home](#) - [About Z](#) - [Where we stand on Sustainability](#)

Where we stand on Sustainability

Hear Mike, our CEO, talk about why sustainability matters and why we reckon we can be at the heart of the solution:



To us, sustainability means acting in a way that benefits the future of the neighbourhoods we operate in and the planet we live on. We think it's good for business, good value and good sense.

Here at Z, we:

- are committed to doing the right thing by New Zealand
- are a transport energy company, not an oil company — so we're not wedded to fossil fuels
- reckon we're in a unique position to move from being a part of the problem to being at the heart of the solution.

If you've got a couple of minutes, have a read of our [Sustainability Stands](#) [PDF] or check out our [Sustainability Code of Conduct](#) for our suppliers. Gerri, our Sustainability Manager, [Introduces the Sustainability Code of Conduct](#) and explain how it will work over our on [Youtube](#) channel.

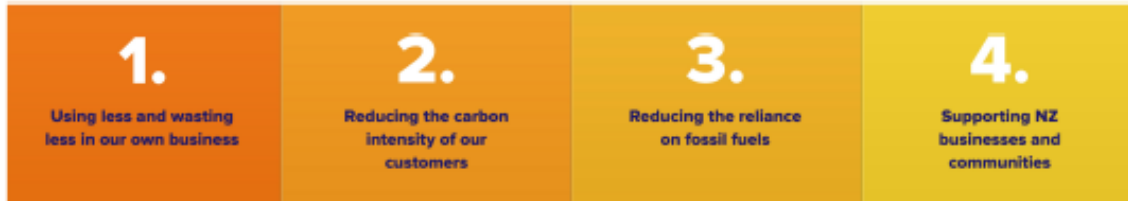
To watch the Youtube clip:

<http://z.co.nz/about-z/sustainability/#.VwmQ8ctf3IU>

7.2 Appendix 2 – Pillars of the sustainability stand

You gotta start somewhere so we're starting here

We take our responsibilities seriously. We're determined to see Z having a game changing, leading or active position in four key sustainability areas by 2015. They are:



The table below outlines the sustainability goals we plan to achieve by 2015 in each of the sustainability areas we have committed to. True to our value of being straight up, we will track our progress against our sustainability goals and starting from next year, we will tell you how we are tracking against them.

1. Use less waste less for 2015

Through our embedded operational processes we have reduced our energy demands and outgoing waste streams

Z uses 10% less electricity across the retail network

Z uses 50% less water in retail network operations

Retail operation waste to landfill reduced by 70%

Z's head office is a Zero Waste operation because Z people understand the impacts of the waste we generate and play an active role to reduce it

2. Carbon intensity for 2015

In the way that we conduct our business and the tools we have provided to our customers we have reduced the carbon emissions of Z and our customers

The carbon footprint of Z's head office has been reduced by 25% and is held or reduced further for the next five years

In New Zealand, Z has reduced the distance it travels to deliver fuel by an average of 15% for every litre of fuel delivered

Delivery emissions are reduced by 25% independent of the reduction of redundant kilometres

Z reduces the carbon footprint of our C-store operations by 10%

Z works with ten significant suppliers to reduce the carbon intensity of our activities together by 25%

With Z's help, customers have reduced their fuel consumption and been rewarded for their efficiency

3. Fossil fuel reduction for 2015

By working with other organisations, investing in new technologies and researching and commercialising alternative fuels, Z has reduced New Zealand's reliance on fossil fuels

We are the leading New Zealand supplier of fuel products and services that minimise the environmental impact of our customers' businesses, including through:

Becoming New Zealand's leading biofuel supplier by 2014

Using more than 10% biodiesel in our business

Becoming the leading implementer of emergent transport energy in New Zealand

4. Support New Zealand for 2015

As a business, Z has demonstrated its commitment to New Zealand through its community programmes, sharing its skills and safety culture

Every Z employee is trained as a safety at home ambassador

Our safety performance is best in class and other New Zealand companies seek us out to improve their own safety performance

Z shares 365 skilled worker days with New Zealand every year

Z is recognised in New Zealand for developing the skills of our own team and the people we work with

Our neighbourhood investment continues to help people who need it in the communities we are connected to

7.3 Appendix 3 – Master list of interview questions

Questions for strategy triangle alignment
Thinking about the Z sustainability strategy, can you tell me what it aims are?
Do you know of any plans that are in place to achieve the strategy?
Is sustainability important at Z and how is this demonstrated?
Strategy triangle alignment between Org Strat
Which specific roles in Z are responsible for sustainability?
Which specific roles in Z make decisions on sustainability?
Which specific roles in Z do you expect are undertaking activity to help with achievement of the sustainability goals?
Is sustainability included in job descriptions, if so, is this effective?
Which, if any role in Z has a financial incentive through the short term incentive scheme to achieve the sustainability goals?
Can you tell me about any HR policies or practices that have been put in place to support the sustainability stands?
Have any organisational structure changes been considered or implemented either now, or in the past, to support the achievement of the sustainability strategy?
Can you tell me about any expectations Z has formalised with suppliers to support the sustainability stands?
Are there any barriers from an HR perspective that you think could get in the way of achieving the sustainability goals?
Strategy triangle alignment between ICT
Can you tell me what specific responsibilities ICT has to support the achievement of the Z sustainability goals?
Are you aware if a strategy for sustainability activities in ICT exists?
Can you give examples of any impact that the Z sustainability strategy has had on technology decisions?
Can you provide me with any examples of activity performed in IT that is aligned with the sustainability stands?
How do you know if you've done a good job supporting sustainability strategy?
ICT Maturity questions
Does Z provide employees with the ability to telecommute? (Work from home/mobile office)
<i>Do you need special permission from your manager to use it?</i>
<i>Is it used widely?</i>
<i>Is it advertised and encouraged? Incentivised?</i>

Do you know of any policies or procedures in place that encourage a reduction in printing and toner use?
<i>Is printing usage tracked? Is information on consumption available?</i>
<i>Is anything in place to reduce the amount of printing and toner?</i>
<i>Is it tracked at an individual level?</i>
Are servers virtualised?
<i>To what extent?</i>
<i>Who is responsible for managing this?</i>
<i>Is this a priority for ICT at Z?</i>
Is power efficiency considered when purchasing IT assets?
<i>How does this work? (Is it a requirement/priority - would an item not be purchased because of its power consumption)?</i>
<i>If purchasing is managed by a supplier, have we given them instructions on minimum standards of power efficiency expected?</i>
Are IT assets disposed of in an eco-friendly way?
<i>If disposed of via a supplier, have we given instructions that we expect an eco-friendly disposal?</i>
<i>What is the procedure?</i>
<i>Are policies in place? (Implemented and advertised)?</i>
<i>Do they have to be followed?</i>
<i>Is there is standard process for disposal across Z?</i>
Final misc. questions
Do you feel you have the information, training and other resources that you might need to support the sustainability strategy? What are these?
Can you tell me about any barriers that you've faced when trying to support the achievement of the sustainability goals?
Can you think of anything new that Z could do that will assist the achievement of the sustainability goals?
Is there anything else you would like to add?

7.4 Appendix 4 – Signed Human Ethics Paperwork



SCHOOL OF INFORMATION MANAGEMENT
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Mike Bennetts
Chief Executive Officer
Z Energy
PO Box 2091
Wellington 6140

3 July 2016

Invitation for participation in case study project

I am currently enrolled in the Victoria University of Wellington course MMIM 590: Case Study Project which I am taking as part of my studies for the Master of Information Management degree.

This letter is to invite Z Energy to participate in case study research. Z will be identified in the case study which may include possible publication in academic conferences and journals or dissemination at academic or professional conferences. The case study is designed to investigate the alignment between the Z sustainability strategy and the ICT strategy. It will also explore the maturity of sustainability in ICT as it is positioned to support the business sustainability strategy. I hope to understand the alignment between the strategies.

I would like approval to interview approximately six Z employees with roles that either contribute to strategy creation or are involved in processes that could contribute to sustainability.

The data will be aggregated and not attributed to any individual.

Please sign the bottom of this letter if you agree to Z participating. This indicates your agreement to use any information and opinions you provide for the purposes of the report, and that you are aware of the research conditions, including the purpose and use we will make of your comments.

Please feel free to contact me on 021 817 236 or by email algarcaro1@vuw.co.nz or the course director, Dr Jocelyn Cranefield on (04) 463 6887 or by email jocelyn.cranefield@vuw.ac.nz, if you require further information about the course and the assignment, or the informed consent requirement.