

Another senior executive spoke in on the topic of green recovery. They outlined some of the issues with green recovery in the following statement:

“At some point during the pandemic, we began thinking about when the pandemic is going to end, and... one important conversation has been about green recovery... about going back to the office and getting production levels back to the pre-COVID era, but the focus is about strategies to make that process more environmentally friendly. How do we pollute less? Do we go back to the office 100%, or do we use some hybrid system? Here at a large IT company in South Africa, we are considering a distributed team because it gives us the benefits of working from anywhere whilst still connected, and we have the option of a meeting where it’s feasible. So, no’ you don’t have to travel to the office every day, that way we reduce emissions from the daily commuting. Now Green ICT comes into play by identifying [and] devising efficient and sustainable information and communication technology solutions to facilitate that... and find viable and sustainable solutions to this [global supply chain] crisis, using... data and [and analytics] to develop smart, efficient, and sustainable supply chain networks.” (Participant 1)

The statement highlights the favourable environmental implications of green recovery as well as a greater emphasis on employing ICT for sustainable development. The comment also emphasises the supply chain issue caused by the worldwide pandemic, which has added to the difficulties of making the move to remote labour. Supply chain disruption caused a global chip shortage issue, compromising the supply of equipment required for company continuity under remote work situations. The organisation had difficulties owing to supply chain restrictions, with Participant 18 admitting they "had supply issues" (Participant 18). Supply chain bottlenecks were ascribed to the reasons surrounding supply difficulties, as Participant 3 highlighted in detail.

“Covid-19 put a lot of pressure on the global supply chain. Borders were closed. Planes were grounded, ships were not moving, factories were closed and all that. So, there were

delays with getting new equipment. Everything slowed down. And then there was the global chip shortage. It was a crisis” (Participant 3)

The effects of supply chain restrictions and business disruption filtered down into operations, resulting in missed business opportunities and project delays. These considerations had an influence on project delivery as a whole. In addition to the issues stated above, several employees struggled to acclimatise to working from home. Other *“team members did not have reliable internet connections”*, while others *“received their equipment late” (Participant 1).*

Despite the problems faced by supply chain restrictions caused by the COVID-19 pandemic, the emergency reaction implemented by a big IT business in South Africa looks to offer considerable long-term benefits for Green ICT adoption. The emergency reaction to the pandemic appears to have hastened the policy to reduce the organization's office footprint and include remote work into the organization's long-term sustainability plan. The pandemic may cause future behaviour changes that benefit the environment.

5.4.2 Theme 2: Green ICT strategies to reduce enterprise-wide carbon footprint

This theme falls under the Green IT readiness. Using the GITAM model, the study sought to establish the Green ICT readiness of a large IT company in South Africa by exploring the strategies they used to reduce enterprise-wide carbon footprint. The following sub-themes emerged:

5.4.2.1 Power management

Energy usage is one of the areas that offers chances to lower enterprise-wide carbon impact. The usage of power management tools is widespread throughout the company, with several participants noting it, including Participant 2, who said:

We are also encouraged to turn off all devices that are not in use. Our systems also have power saving mode which kicks in to save power when devices are not in use. (Participant 2).

A top executive at a prominent South African IT firm highlighted why power management was critical to the organization's operations. They mentioned cost savings as one of the key advantages of energy-saving initiatives:

“The other benefit is realised by lowering the costs associated with utilizing less energy from our computing needs. The cost of energy that we need to run our operations accounts for a major portion of our expenditure, and the benefits of lowering our electricity consumption are substantial.” (Participant 1).

Another ICT expert responded to the thoughts that power management was an essential component of the organisation by saying:

“Power management is a huge thing for us. Most of our equipment should have some form of power management features. This reduces electricity wastage and saves us money.” (Participant 3).

Another significant component of power management and energy consumption mentioned by Participant 4 is the use of energy-efficient equipment, as stated in the following statement:

“We also aim to reduce our energy consumption with our equipment, so we use high-efficiency equipment and make sure that all non-vital equipment is turned off when not in use.” (Participant 4).

5.4.2.2 Paper-reduction

Paper reduction is one of the areas where ICT firms may minimise their enterprise-wide carbon footprint. The firm looks to be making substantial headway towards paper reduction and paperless operations. The participants demonstrated that there was consideration for the environmental impact of printing and paper use, as seen by Participant 10's statement:

“One of the first things that we did was to look at our printing. We consider the impact of the production of paper on the environment. A lot of trees are cut for us to have the paper that we print on, and you only use that document once and throw it in the trash. We said let’s limit our use of printing in the office. We don’t have printers at every desk, and we print only when necessary.” (Participant 10).

The above statement shows issues regarding the impact of removing trees for paper manufacture, as plants absorb a significant amount of carbon dioxide from the atmosphere. Participant 10 also states that lowering the number of printers was one of the measures used to decrease printing. Participant 15 explains how this works in conjunction with a centralised printing system:

“We have a system for printing that we use. We don’t have a printer at every desk or every office. Printing is now centralised. There is a single printer for several offices and groups of workers, and we print only when we need to. Printing on both sides of the paper is another measure. By taking these measures, we have reduced the amount of paper we use, and the money we spend on printing is saved.” (Participant 15).

Employees appear to be urged to utilise double-sided printing to save paper. Paper recycling is another strategy used by the company to reduce the environmental effect of its printing. Participant 25 claimed in the following statement that they recycle printer paper. Participant 25 stated how the centralised printing system has been beneficial in

limiting "senseless printing" and introducing accountability for papers sent to the printer by employees:

"With paper, if we use paper, we also recycle that, but the main aim with paper is to reduce the amount of printing that we do, so we centralised our printing systems. You no longer just send your documents to the printer whenever you press ctrl p. You go to the printing station. You present your card, and then it prints while you're waiting so that we reduce the possibility of senseless printing of documents." (Participant 25).

Employees are aggressively urged to use digital documents in light of many initiatives in place to limit printing. According to Participant 11, cloud document storage is strongly recommended for employees since it enables for smooth information and document exchange among co-workers.

"We are also sharing electronic documents rather than paper, and instead of printing information, we just store it on our devices and in the cloud." (Participant 11).

Participant 12 discloses an additional benefit of saving information on devices rather than printing in the following statement:

"Instead of printing on paper, we view the documents on tablets and laptops, and we store them there. That creates a lot of room and avoids having dedicated storage space for paper documents." (Participant 12).

By removing the requirement for specific physical document storage and administration, the organisation has instead developed an electronic document management system that also serves as a platform for electronic document distribution and signature. According to a corporate official (Participant 20), this development demonstrates the organisation's dedication to going paperless and contributing to environmental sustainability:

“...But we are also moving on to cloud-based digital document delivery and signing system. I think this shows our commitment to going paperless. And these are some of the small steps we can take to help the environment.” (Participant 20)

Whereas Participants 9 and 21 provide insights into the benefits of cloud document management systems, such as the ability to integrate smart contracts and reduce printing costs:

“We now encourage electronic documents. We even have our in-house document management system that we also use to facilitate smart contracts. Signing paperwork is now done online without burning fuel just to ink in a signature.” (Participant 9)

and:

“There’s been a strong drive within the company to reduce printing. Everyone is now encouraged to use electronic documents, and even for signing documents, it’s all done electronically now. We do most of this for the cost-saving benefits.” (Participant 21)

The findings are consistent with numerous studies on the benefits of paper reduction as a cost-cutting approach and an environmental sustainability strategy (Jayaprakash & Pillai, 2022; Fernandez et al., 2015). Furthermore, according to the research, electronic document management improves efficiency by making it easier to retrieve data files utilising computerised search capabilities (Jayaprakash & Pillai, 2022). Furthermore, companies generate less waste that must be recycled, burnt, or disposed of in a landfill (Zhang & Liu, 2015). Businesses may save money on supplies such as toner, printer and copier maintenance, paper, power, and shredding services by printing less (Esfahani et al., 2018).

5.4.2.3 Telecommuting

Another Green ICT practise that a prominent IT firm in South Africa Ltd implements is telecommuting or remote work. Employees of the business were observed increasingly

working from home, particularly in light of the ongoing COVID-19 epidemic, using the so-called 'distributed team' concept. As Participant 22 pointed out:

"We have downscaled our premises so that the people do not have to travel often or ever to a particular customer or workplace they can do all of it. We implemented an 80/20 rule where 80% of your time is spent working from home, and 20% might be required in the office. While this was a forced consequence of the pandemic, we are seeing the benefits of not being confined to only one geographical area for work purposes because you can now be more productive wherever you are." (Participant 22).

However, higher productivity and the ability to work from any location are not the sole advantages of telecommuting:

"Working from home helps us in our efforts to reduce our office footprint. With a smaller office footprint, we can save on keeping the office running things like heating, air conditioning and so on. At the same time, it is good for the environment because we now have fewer people contributing to the daily air pollution. With a distributed team, we can even downsize our office in the future. That way, we can even save on rentals." (Participant 22)

This research also reveals a correlation between green recovery and office footprint reduction, implying that both regulations are driving Green ICT deployment. Given this practise, the business provides its staff with the tools and equipment they need to work remotely, such as a sufficient internet connection and PCs. A senior manager (Participant 6) explained how the business was encouraging remote work as part of its attempts to reduce the size of its office footprint:

"We are more and more aligned with our staff to live and work outside our borders or live and work outside of the city centres because distributed teams are now possible, and we have also allowed their allowances. We have given our staff allowances to pay for

connectivity wherever they are. We are funding that so that they are capable and able to deliver services from wherever." (Participant 6).

This evidence demonstrates that governance considerations were taken to promote remote working by allocating the appropriate resources and establishing a budget for the effort. Government incentives are recognised as a crucial driver of Green ICT deployment, according to the GITAM model (Molla, 2008). According to the research, telecommuting is a significant technique to reduce power usage and the need for new computers (Tutusaus et al., 2018). A virtualized workforce also allows for lower operational costs and smaller footprints (Unhelkar, 2016).

5.4.2.4 ICT end-of-life policy guides recycling and reuse

This part of the sub-theme falls under Green ICT readiness on the GITAM model. The ICT end-of-life policy seems to influence the disposal of ICT equipment. The recycling practices appear to be guided by government regulations, industry and customer expectations, and the company's cost-saving and corporate image strategies. The following remark made by Participant 17 relates the recycling practices to comply with government regulations:

"We recycle our e-waste, and we do this to comply with the regulations on e-waste disposal. If I can be specific, the National Environmental Waste Act regulates these kinds of things relating to the disposal of electronic waste. We have a recycling centre for recycling things like paper, outdated computers and broken-down IT equipment." (Participant 17).

Regulatory compliance is a common subject in recycling practises, as numerous other participants mention the requirement to dispose of electronic garbage in an environmentally friendly manner. Participant 12 highlights regulatory pressure to guarantee that e-waste disposal does not contaminate the environment:

Regulatory pressure drives initiatives such as e-waste management and recycling. We are obligated by law to dispose of our garbage in an environmentally friendly manner. We can't just destroy our old equipment or do something like that." (12th participant)

Participant 21 adds the cost-saving benefits and the requirement for regulatory compliance in the areas in which they operate:

"We do most of this for the cost-saving benefits and to keep up with government regulations in all the countries we are stationed in." (Participant 21).

Paper and other electronic debris were also submitted to the recycling site by the participants. Damaged or non-functional equipment was identified as being recycled for components to be used in fixing broken-down computers. It is also demonstrated that a significant South African IT firm relies on approved recycling partners to assist with compliance, as stated by Participant 12: "In addition to that, we are doing a lot of recycling. We have a couple of recycling centres, and for the items, we can't recycle ourselves, we work with our the-waste management partners. All our recycling efforts have a strong focus on reducing the output that contributes to pollution." (Participant 12).

Recycling practises appear to be deeply established throughout the firm, motivated by regulatory compliance, corporate image, cost-cutting, and a desire to reduce environmental damage. Company policies and end-of-life guidelines for ICT equipment advise electronic waste disposal in accordance with government requirements. The findings are consistent with the research, which suggests that waste management regulations in South Africa have resulted in a beneficial outcome, with less e-waste ending up in landfills (Lawhon, 2013). Legislative recycling procedures must be properly implemented in order to have the least harmful impact on the environment and human health (Bekaroo et al., 2016). The GITAM model emphasises that if the ethical motivations of Green IT give motivation for organisations to deploy Green ICT in order to fit with societal values and expectations.

5.4.3 Theme 3: Reducing enterprise-wide carbon footprint through Green ICT procurement and sourcing practices

This theme falls under the GITAM model's Green ICT preparedness. Data suggests that firm policies affect Green ICT related practises, since participants claim that Green ICT is "embedded" in their policies (Participant 20):

"... when we look at vendors we work with, the systems we choose to apply, the software we utilise, and the processes end to end in that structure, it is underpinned by Green ICT from a sustainability perspective. The main strategy is to save money... While we are saving money, we are thinking of the best way to deliver things with the least resources, whether that's people, time, energy, everything" (Participant 20).

According to the research, significant ICT companies in South Africa prioritise ecologically preferable ICT purchase from a sourcing standpoint. This includes implementing sourcing and procurement practises such as measuring the environmental impact of the ICT supply chain, evaluating hardware, and including green problems such as recyclable design and packaging into vendor assessment and ICT buying choices (Molla et al., 2009). However, the preceding sentence also emphasises the necessity of saving money, implying that energy savings concerns are also entrenched in procurement strategy. Participant 9 indicated that it was mandatory for "vendors and business partners" to provide equipment and "gear that satisfies" their required "energy-saving standards." This claim was supported by Participant 12, who affirmed how the sourcing and procurement policy guides the procurement process.

"We have policies within a large ICT company in South Africa that dictate the kind of computers that we can use. There are specific energy usage and operational parameters that we need to use. All the ICT equipment we use must meet specific energy ratings that allow us to reduce our energy use." (Participant 12).

This result demonstrates that the procurement practises employed at a significant South African IT company are impacted by the organisation's sourcing and procurement policy. Participant 12 went on to describe some of their purchase needs, citing the Energy Star Initiative:

“As an organisation, we have certain standards or criteria for the type of equipment we use. The equipment we buy must meet certain energy efficiency... specifications. The Energy Star initiative is now an international standard for electronic equipment that provides ratings on how much energy equipment is used. You can notice that all our computers have Energy Star stickers that assure us that the equipment we use is environmentally friendly.” (Participant 12).

Participant 16 also indicated the energy efficiency criteria for new equipment, emphasising that efficient equipment leads to energy savings, a significant issue for cost reduction:

“We established rules that restrict the types of computers we may use, along with specified energy consumption and operational specifications. All the IT equipment we use must fulfil particular energy ratings for us to save energy. So, our computers, for example, have Energy Star stickers to indicate the rated energy usage and efficiency.” (Participant 16).

From these findings, it can be concluded that the sourcing and procurement policy guides the procurement process for buying new equipment. The procurement process emphasises environmentally preferable ICT purchasing. The influence of sourcing and procurement policy cascades down to initiatives to reduce enterprise-wide carbon footprint.

The findings concur with the findings of Hendandez (2020b), who discovered that green ICT procurement helps guarantee that environmental concerns are integrated into buying policies, plans, and activities. Furthermore, green shopping encourages recycling, reuse, and resource conservation. There are no industry standards for green procurement (Mcobrein & Ackah, 2019). Green procurement also ensures that purchases give

exceptional value for money by considering the whole life cycle and resulting in social and economic advantages for both the organisation and the environment (Singh & Chan, 2022).

5.4.4 Theme 4: Embracing Green ICT practices for business sustainability

This theme is understood to be in the context of Green ICT drivers. The subject arose from the desire to contextualise attitudes towards environmental sustainability. General questions on the significance of the Green ICT concept and how it is perceived inside the company were sought. According to the findings, there appear to be competing demands between commercial sustainability and environmental sustainability. The analysis discovered indications that the organisation prioritised environmental sustainability. For example, the concept of Green ICT is generally understood to be related to the concept of “*sustainability in ICT operations*” (Participant 22). This conceptualisation shows Green ICT is seen as a means first to minimise the negative impact of ICT on the environment and, secondly, to increase the positive impact of ICT on the environment. Ultimately, Green ICT is viewed as an enabler for green initiatives in other sectors of the economy, as illustrated by the following response from Participant 18:

“When it comes to lowering the environmental impact of IT, you... consider how products are manufactured... used, as well as how they are disposed of after usage. You aim to minimize environmental impact by recycling and reusing obsolete equipment, conserving energy, and considering sustainable procurement. The second aspect is about using ICT to minimise the effects of global warming and reduce climate change by supporting sustainable initiatives in other industries like sustainable mobility, green logistics and things like that. These are areas where you can use tools and techniques from information systems to drive sustainable projects, collecting and reporting ecological data, using analytics and machine learning to improve other fields, so they become cleaner” (Participant 18)

The researcher also investigated the significance of Green ICT and how it linked to the overall strategy of the firm. Climate change worries were expressed by participants, indicating that *“Green ICT is very important in the help to (sic) fight against climate change and global warming.”* Participant 14 appeared passionate on the matter of environmental sustainability, showing regard for future generations and concern for the environmental impact of technology use:

“Green ICT is... a commitment to make sure that everyone who uses technology is aware not only of the benefits, but the impacts on the environment and climate change, and... what must be done to use technology with environmental sustainability in mind. We do not have to be selfish on this issue of climate change. We must keep future generations in mind. Will they benefit from what we are doing now, or are we putting them on a back foot? ... You must think, what if I just do the right thing now. I think that if we prioritise Green ICT, we can use our state-of-the-art information systems to track environmental parameters and preserve data that future generations can ... use” (Participant 14)

A participant in the organisation's senior management (Participant 15) confirms that environmental sustainability is one of the organization's goals in the following statement: *“As part of our governance structure, we have sustainability themes, about six of them, and the last theme is about acting on climate change. Going green is part of our priority goal, and we are highly aware of the strong social consciousness to prevent climate change and the technology we use and offer to customers offer innovative solutions to create an environment that is more secure, healthier, and efficient.”*

Using the concept of social awareness, one may link to the concept of corporate social responsibility and how the business is motivated by ethical concerns to evaluate the impact of its operations on society and the environment. Participant 7 offered the following comment in support of the view that ethics and social consciousness are integrated inside the organisation:

“With our core business being technology, our core focus is on society, so we must look at the impact of our work on society. For example, we take it seriously doing ethical business with our clients that are developing technologies technology Solutions that are ethical.”

Participant 5 made a statement in this respect, emphasising how corporate social responsibility is linked to organisational strategy:

“The overall organisational strategy also encompasses corporate social responsibility, and I believe that Green ICT ties into that perfectly well because we have to be a responsible organisation taking care of our environment as well as the society.”

Other IT professionals and organisational executives demonstrated a good approach towards social responsibility as well. One member stated, "Ensuring that our IT operations do not have any negative effects is part of our obligation to corporate responsibility." *We must do all in our power to preserve the environment*" (Participant 11). The personnel of the large ICT firm in South Africa are motivated to do the right thing since the corporation has a favourable attitude towards social responsibility. Participants also talked about "conscious capitalism," with Participant 11 saying that it "should go hand in hand with a serious level of consciousness about our environmental impact so that the impact of our work serves society for good on all fronts" (Participant 11).

These comments indicate a good company attitude towards environmental issues and the use of Green ICT. However, it appears that environmental sustainability may not be the primary motivator of Green ICT implementation. Rather, lowering operating expenses appears to be the primary motivator for Green ICT deployment. This is demonstrated by several remarks made by participants. When asked how Green ICT connects to the organization's overall strategies, one of the senior managers (Participant 6) responded as follows:

"So, the overall strategies save money... Before being sustainable, it saves money. We are in a big cost-saving mode because of where the world is now. Our job is also to save money and costs for our clients... So, it is extremely strategically related. So, while you are saving money, you are thinking of the best way to deliver... [with] the least number of resources, whether that's people, time, energy, everything."

The comment above explains how Green ICT deployment fits within the organization's cost-cutting plan by achieving results with the fewest resources. It also implies a preference for commercial sustainability above environmental sustainability. The comment is supported by Participant 15, who mentioned the relevance of Green ICT in guaranteeing business sustainability by boosting value proposition and benefiting the organization's bottom line:

"All the practices for green IT that we adopt [come] as part of our larger strategy towards building a sustainable organisation. We are aligning our IT to better achieve our objective [while] at the same time managing risk and meeting requirements for regulatory compliance that's part of the GRC framework. Adopting Green ICT enhances our value proposition to clients who also have environmental concerns. We can retain more of them and improve our sales volumes. The green initiatives we embark on directly relate to our bottom line. The more we recycle and reuse, the more we can save."

This demonstrates the importance of Green ICT adoption in improving the organization's value offering. Participant 20 demonstrates a high focus on compliance and the economic benefits of increasing the organization's value offer in the following statement:

"So, everything is tied into our larger strategy towards building a sustainable organisation by making sure we meet the requirements for our Governance, Risk and Compliance framework. It is not only about compliance, but then it also relates to our value proposition to our valued clients and stakeholders. They will see us as both responsible and compliant because of our efforts to address environmental concerns. Our business will benefit from higher retention rates because of this."

Furthermore, data shows that Green ICT deployment matches with the organization's cost-cutting plan because these practises enable for the delivery of outputs with the fewest resources. Green ICT appears to be viewed as both a reaction to the need to improve the value offer and one of the answers to lowering operating expenses. This outcome indicates that the organisation takes a reactive approach to Green ICT deployment rather than prioritising environmental issues. Participant 20 emphasised the absence of environmental sustainability in the organization's vision and goal statements, indicating a lack of prioritisation:

“I would say sustainability is an important component of our organisation that guides our sustainability practices. But it’s not part of our vision and mission statement. You see, it’s not formalised in that sense.”

These findings highlight the competing agendas of corporate and environmental sustainability. Nonetheless, it is heartening that a significant South African ICT corporation, as indicated in the next section, includes Green ICT practises that contribute to favourable environmental consequences.

The findings reveal that a significant South African ICT business wanted to include environmental sustainability into its operations. The GITAM paradigm, which emphasises the significance of context in aiding Green IT deployment (Molla, 2008), best explains this mindset. To that end, the organisational context is responsible for enforcing environmental standards that promote Green ICT, and at the organisational level, they establish norms for workers to comply. Hankel et al. (2018) agree with Fernando et al. (2018) that Green ICT should be considered as a potential solution to accomplish long-term results rather than a cause of environmental problems. They go on to say that such a viewpoint necessitates a new approach to operations with the goal of producing good results and enhancing an organization's economic and environmental development. Such a business mindset dispels the myth of an economic-ecological conflict, demonstrating that Green ICT should be

leveraged to provide beneficial economic, social, and environmental outcomes (Hankel et al., 2018; Fernando et al., 2018).

5.4.5 Theme 5: Green ICT policy

This subject focuses on the GITAM model's Green ICT drivers. This subject reports on the extent to which green policies are established and implemented across the whole value chain of the firm. The insights provided by this subject aid in determining if a big South African ICT firm has a defined Green ICT policy.

There does not appear to be a clearly defined Green ICT policy that describes the roles, duties, and processes for Green ICT implementation, implying that the organisation takes a reactive approach to Green ICT. For example, Participant 4 made the following remark:

“People just talk about the bigger picture of Green ICT, but if we look, for example, in our organisation, there is no framework on how to implement it.”

The same participant went on to add a disclaimer, stating:

“But I should say that we have Green ICT practices that we implement in our day-to-day work.”

Participant testimony on many accounts reveals a significant lack of a clearly defined common policy for Green ICT deployment. One of the participants (Participant 7) responded as follows:

“I cannot say that we have a specific strategy per se, but we have adopted a few practices to ensure that our work has a reduced impact on the environment.”

Another participant (Participant 20) also lamented that the policy is not formalised:

“I would say sustainability is an important component of our organisation that guides our sustainability practices. But it’s not part of our vision and mission statement. You see, it’s not formalised in that sense.”

Refer to Participant 2's comment, which referenced to general expectations and industry norms, for insights into the drivers driving Green ICT practises in the organisation:

“Then it is the general expectation that businesses minimise the impact of their operations on the environment. The whole industry is pushing for green computing, and we also must go in that direction.”

Later in the interview, the same Participant made another admission, this time referring to government restrictions, namely those governing electronic trash disposal:

“Honesty it’s external pressure from regulations and industry standards. We have to comply with government regulations, so we recycle our electronic waste.”

Other participants, including Participants 3 and 4, made remarks reinforcing the view that the reactive approach to deploy Green ICT is motivated by external pressure as well as cost reduction, as seen in the two quotations below:

“Green ICT saves money. Thus, we find ourselves in a scenario where we need to reduce our expenditure and become more lucrative, and introducing Green ICT comes up as a solution. We also face pressure from the government and customers. On the one hand, the government has regulations requiring us to green our operations.” (Participant 3)

Participant 3 added:

“Because of the level of awareness of environmental issues, there also comes regulations, for example, on responsible disposal of e-waste. We must comply with those regulations.” (Participant 4)

The findings indicate that, in addition to lacking a clear formal strategy or policy framework for Green ICT implementation, the organisation takes a reactive approach to Green ICT. As a result, an apparently haphazard collection of tactics is employed. According to the research, the lack of a clearly defined uniform framework for implementation is a barrier to effective implementation (Molla et al., 2009). Despite the lack of a clearly defined Green ICT policy, the findings demonstrated that general business policies at a big South African ICT company significantly affect Green ICT implementation by directing the practises and technology that enable implementation.

5.4.6 Theme 6: Implementing Green ICT for business sustainability

On the GITAM model, this subject addresses Green ICT intention and adoption as well as Green ICT readiness. The parts that follow draw on study findings to show how deploying Green ICT adds to measurable and good results for the organisation. According to the data, Green ICT implementation is mostly focused on one of two outcomes: cost savings or compliance with government rules or consumer and industry expectations. One of the senior managers (Participant 17) stated how cost reduction and customer expectations are major drivers for Green ICT:

“Green ICT lessens unnecessary expenses by adopting hardware or software solutions that save energy or reduce energy loss. You can see that it shows a good consumer image because of how important going green and preventing climate change has become for consumers.” (Participant 17).

The same participant went on to explain why these results are critical for the future commercial viability of a significant ICT company in South Africa:

“I have mentioned how Green ICT saves money, so we get into a situation where we say we need to cut our spending and be more profitable. Implementing Green ICT comes up as a solution. We also get pressure from the government and consumers. On the one hand,

the government has legislation that pushes us to green our operations. On the other hand, consumers and investors are more conscious of matters of climate change and global warming and pollution. So, we have to comply with the government's requirements; otherwise, we'll be shut down, and if we don't go green, we will lose our customers. Going green is an effective marketing strategy that attracts customers and investors and grows the business's revenues." (Participant 17).

The accompanying quote from Participant 17 demonstrates how important Green ICT is for corporate sustainability objectives. These results assist the company in saving money and improving its value proposition without losing business due to noncompliance with legislation or inability to fulfil customer expectations. The sections that follow are given as sub-themes that demonstrate how a significant South African ICT firm implemented Green ICT. The topic also emphasises the good environmental implications of these practises. The sub-themes range from procurement and sourcing processes to energy consumption and power management, telecommuting/remote work, paper reduction, recycling, and technology usage and development. 5.4 highlights the major practices employed at a large South African ICT organisation.

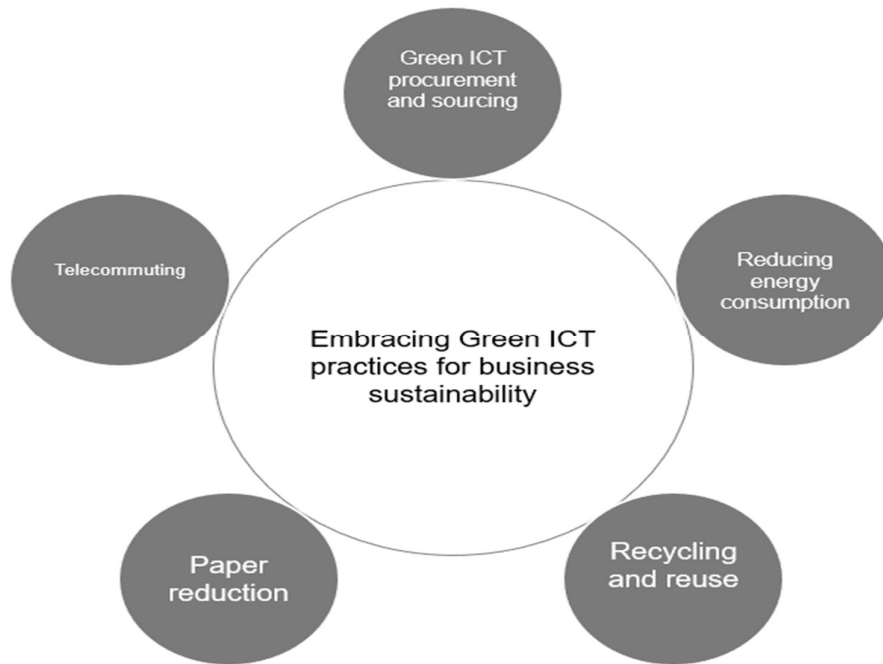


Figure 5.4: Implementation of Green ICT at a large ICT company in South Africa

In accordance with the GITAM model's organisational framework, a big South African ICT firm analyses the environmental footprint, recyclable design and packaging, and proactively conducts vendor assessments based on environmental factors. Desktop power management systems have been described in the literature as a simple and efficient technique to save money and minimise emissions Ziemba (2019a). This study backs up Ziemba's claims, with participants agreeing that the implementation of power management systems is primarily motivated by cost savings and the avoidance of energy waste. The usage of power management systems is also related to the use and development of technology. Previous study found that an organization's technical skills influence its capacity to successfully integrate Green ICT (Fernandez et al., 2015; Lundfall et al., 2015; Klimova, 2018).

Green ICT technology was identified as reflecting how firms acquire and construct a more ecologically effective ICT infrastructure. This includes technologies and information systems

for lowering the energy consumption of powering and cooling ICT assets, optimising the energy efficiency of ICT technical infrastructure, lowering ICT-induced greenhouse gas emissions, replacing carbon-emitting business practises, and calculating a company's total environmental footprint (Irfan & Putra, 2020). Green ICT technology readiness, according to Molla et al. (2009), may be determined by examining the extent to which a company has a green business infrastructure. These findings show that the organization's practises are consistent with the research on Green ICT adoption and implementation (Jayaprakash & Pillai, 2022).

5.5 CONCLUSION

In this chapter, we presented, interpreted, and discussed the research findings derived from collecting primary qualitative data. These findings highlighted several themes that addressed the main research question and the purpose of the study. The analysis of the data revealed six main themes: 'COVID-19 emergency response: an unexpected driver for Green ICT implementation', 'Approaches to decrease the carbon footprint across the organization', 'Ambiguous Green ICT policy', 'Adopting Green ICT practices for sustainable business', 'Green ICT policy', and 'Business perspective on sustainability'.

The main focus of the discussion revolved around the implementation of Green ICT practices for business sustainability. This topic was further divided into seven subthemes, out of which four were discussed in detail. These subthemes included reducing the carbon footprint through green ICT procurement and sourcing, power management, and telecommuting. The findings of the study addressed the objectives by examining current approaches, drivers, readiness, and context of Green ICT implementation. The next chapter will conclude the empirical study by presenting the findings, implications for practice and management, and recommendations for future research.

CHAPTER 6: INTERPRETIVE FRAMEWORK FOR GREEN ICT

6.1 INTRODUCTION

The purpose of this chapter is to propose an interpretive framework for Green IT. The proposed framework is associated with the major themes associated with seminal works on GITAM, that was enhanced through a qualitative investigation of participants' experiences during a Green IT implementation. A framework was important in this study in that it helped in structuring the empirical inquiry as well as theoretical development in Green IT research and practice. The framework was informed by the theories discussed in chapter 3, findings from the secondary literature as well as findings from the empirical study.

6.2 THE INTERPRETIVE FRAMEWORK FOR GREEN ICT

The proposed framework for Green ICT expands the models discussed in chapter 3 namely, responsible information systems, theory of reasoned action, norm activation theory, GITAM model, the G-readiness framework and personnel preparedness theory. Based on the literature and findings from the primary study, Green ICT is driven by governance, social and cultural factors, information technology and top management support. As indicated in figure 6.1, the framework has four Green ICT constructs namely: Green ICT management, Green ICT governance, information technology and social factors.

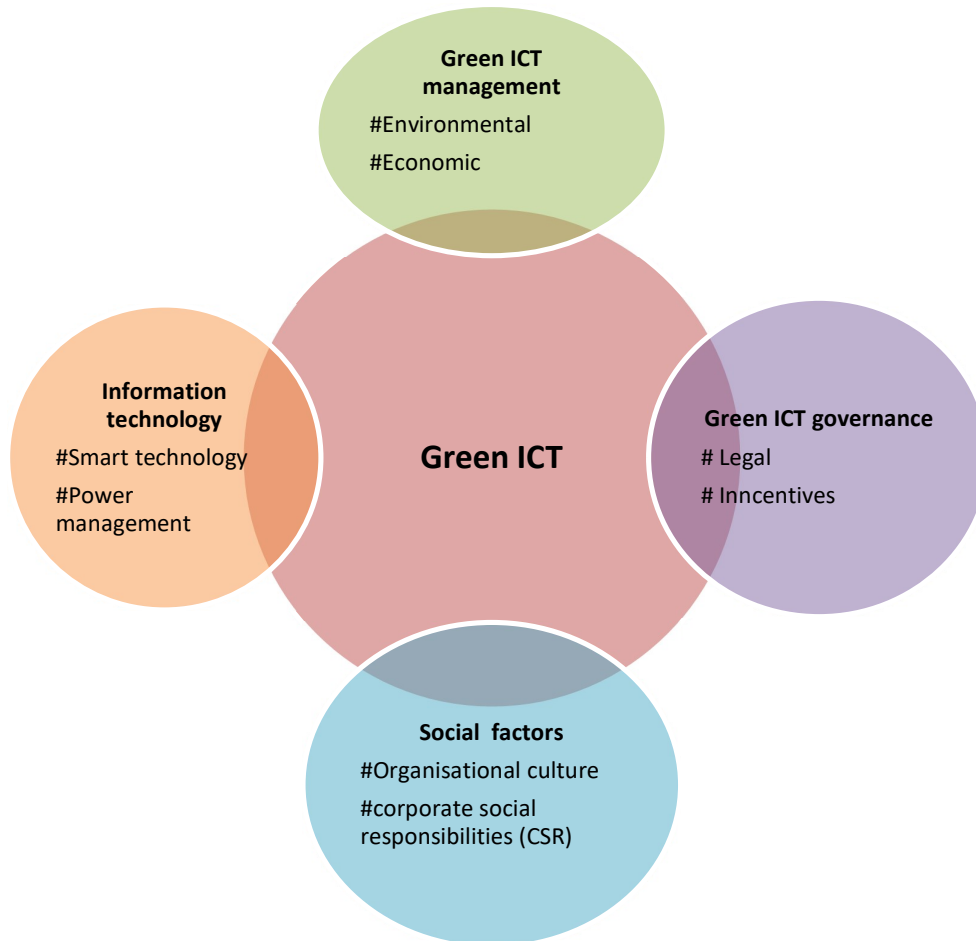


Figure 6.1: Interpretive framework for Green ICT

Source: Constructs were derived from previous models (Ajzen, 1991; Molla & Cooper, 2009; Tornatzky, Fleischer & Chakrabarti, 1990).

6.2.1 Green ICT governance

The findings of the empirical study also highlighted the importance of regulation such as the COVID-19 regulations which pushed companies to adopt Green ICT mechanisms such as telecommuting. However, the findings indicate that there is a lack of clearly defined Green ICT policy. In light of the above findings, the Green ICT governance construct highlights that Green ICT regulations should ensure compliance with Green ICT policies. Under this construct, the researcher included regulatory pressures and incentives. The findings of the literature review revealed that regulatory pressures and incentives were key determinants of Green ICT implementation. This can be done using methods such as certification (Bohas & Poussing, 2016; Alsultanny & Alnassar, 2017) and stiff penalties for non-compliance (Unhelkar, 2016).

6.2.2 Social factors

The findings from the literature review revealed that organisations that implement Green ICT employ activities such waste reduction and increased energy efficiency (Marx & Van Dyk, 2011). In addition, the findings from primary study showed that the case organisation had a sustainability culture which supported Green ICT adoption. However, it was not mentioned as part of the Green ICT implementation strategies at a large ICT company in South Africa yet it provides benefits to both the organisation and the society. To that end, the framework added corporate social responsibilities (CSR) as it ensures that Green ICT compliant companies are visible and through these CSR initiatives, they spread Green ICT awareness among employees and customers. The firm's self-regulation is referred to as CSR. It demands that businesses hold themselves, their stakeholders, and the broader public accountable (Qin Xiliang et. al, 2023).

6.2.3 Information Technology

The findings from the literature review revealed that South Africa is currently witnessing a quantum leap in the digital transformation. Therefore, to address the potential negative effects of digital technologies on the environment, most companies are utilising server virtualisation which allows for one or more "virtual" servers on a single physical host system (Anthony, 2016). In addition, power management solutions are beneficial to both the organisation and the environment as they reduce carbon emissions and provide a quick return on investment for businesses (Ziemba, 2019b). Telecommuting has also emerged as an effective way to cut down on the consumption of electricity (Tutusaus et al., 2018). The literature review findings also revealed that the use of electronic document help to reduce carbon footprint while increasing efficiency by making it simpler to find data files using computerised search capabilities (Jayaprakash & Pillai, 2022). The findings from the primary study highlighted that A large IT company in South Africa was utilising telecommuting and paper reduction.

In light of the findings, the information technology construct addresses aspects of digital technology development and their influence on the organisation. The concept also emphasises digital technology innovation and its impact on productivity and sustainability. As a result, the information technology theme will consider all preceding aspects by including the technological features namely, the use of smart technology and power management. Smart technology encompasses any technologies that incorporate end-user computing, such as smartphones, tablets, and wearable gadgets. The technology construct indicates that investment in smart technology can be used as an assessment tool for Green ICT readiness. In addition, implementing desktop power management systems help to save money and minimise emissions.

6.2.4 Green ICT management

The findings from the literature review and primary study both implementing Green ICT was driven by environmental and economic benefits. Actions such as the use of power management tools and paper reduction was prevalent within the organisation, which help to reduce the carbon footprint while reducing operational costs. In addition, the organisation

utilised of telecommuting, adopting distributed teams. While telecommuting is helps to reduction of greenhouse gases related to travel, it also reduces travelling expenses.

The interactive framework builds on the findings of the literature review and primary study to proposing the incorporation of ecological economics and economic systems with activities, systems, and environmental factors into a long-term strategic view. This promotes environmental sustainability, stability, and ecological balance, as well as the maintenance of critical resource components, systems, and variety (Fernandez et al. 2018).

Green ICT environmental management focuses on ways in which organisations manage ICT gadgets and e-waste. Based on the findings from the study, strategies such as paper reduction and the recycling of paper and other electronic waste helped to indicate the organisation's readiness for Green ICT implementation. Using the research findings as a point of departure, the environmental construct empathises the role of managers in ensuring Green ICT implementation by the organisation. As leaders, they are in a strategic position to influence sustainability culture through activities such as workshops, seminars, and green procurement.

6.3 CONCLUSION

The chapter proposed an interactive framework for Green ICT developing the existing theories, environment-organisation framework (TOE) framework, theory of reasoned action (TRA), and theory of planned behaviour (TPB), GITAM model and the G-readiness framework. The model has three constructs, Green ICT governance, social factors, Green information technology, and Green management. The discussions under these constructs were informed by the findings from the secondary literature and empirical study. The next chapter presents the conclusions and recommendations, which is the last chapter of the study.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

The previous chapter presented the interactive framework for Green ICT implementation. The aim of this chapter is to present the conclusions and recommendations related to the study's findings. The findings from the primary study and literature review were utilised to propose an interactive framework for Green ICT (see chapter 5). In this chapter, the recommendations support the guidelines provided by the interactive framework.

The chapter open by presenting an overview of the research problem and research questions. Further, the chapter presents and overview of the research methodology that was utilised in this study. The conclusions from the primary study are presented. The conclusions presented in the chapter relate to the current approaches used in the implementation of Green ICT, the drivers of the adoption of Green ICT within a large IT company in South Africa, South Africa, and the barricades to the implementation of Green ICT within a large IT company in South Africa, South Africa. The theoretical, policy and academic contributions of the study are presented. In addition, the limitations of the study are explained. Finally, the study provides a note on areas which future research can focus on.

7.2 THE PROBLEM STATEMENT AND RESEARCH QUESTIONS

The ICT tools and infrastructure have major contributors to environmental pollution. As a result, there is a global call to address environmental pollution in organisations through Green ICT implementation (Molla et al., 2011; Pan and Zhang, 2020; Mustafa & Abbas, 2021). However, the lack of knowledge and guidelines for Green ICT implementation threatened to delay the agenda for sustainable ICT. Most of the previous studies on Green ICT

have emphasised promoted consciousness of environmental sustainability and the urgency for large companies in the field to 'green it,' with several frameworks or guidelines facilitating Green ICT implementation into existing business models. However, much of the focus has been on developed countries and some countries in Asia and the Middle east, while developing countries have been under-represented. In light of this research gap, this study sought to explore Green ICT implementation in a large ICT professional services company in South Africa, Gauteng and propose an interactive framework for Green ICT implementation. The study was guided by the following questions:

- i. What are the current approaches used in the implementation of Green ICT?
- ii. What are the drivers of the implementation of Green ICT within a large IT company in South Africa, South Africa?
- iii. What are the barriers to the implementation of Green ICT within a large IT company in South Africa, South Africa?

7.3 REFLECTIONS ON THE RESEARCH METHODOLOGY

The reasoning for the methodological decisions involved in selecting the research methodology and design, identifying the population and sample, data collecting and analysis techniques, and ethical issues for the study is described in Chapter 4. The research was guided by the interpretivist philosophy to interpret and understand the lived experiences of ICT professional at al large ICT company in Green ICT implementation. The study employed a qualitative research approach as it was appropriate to understand the experiences of ICT professional with implementation of Green ICT at a large ICT company (Baek & Park, 2015). To complement the qualitative approach, the study employed a case study design, thus a large ICT professional services company based in Gauteng was selected as the case organisation. Utilising a case study design helped the researcher to have an in-depth and precise knowledge of Green ICT implementation at the large ICT professional services company.

The study population were 140 people who were employed in operational, administrative, and management jobs at a large IT organisation in South Africa. For participant selection, the researcher deployed purposive sampling select 26 participants for the study. The participants met the inclusion criteria which included: extensive knowledge of the organisation's ICT operations, sustainable practises, and participation in decision-making processes. Semi-structured interviews were utilised for data collection. In designing the interview guide, the researcher utilised the GITAM model. The open-ended questions ensured that participants submitted extensive responses, allowing for the collection of richer and more in-depth data to study participant thoughts, sentiments, behaviours, actions, and attitudes towards Green ICT adoption at the firm.

To ensure that the study followed the criteria and guidelines for ethical research, ethical issues were considered during the collection, processing, analysis, and reporting of data and research findings. Therefore, the researcher embarked on data collection only after receiving ethical approval from the University of Pretoria's Research Ethics Committee. The management of the case organisation provided written permission for the researcher to undertake the study. This permission allowed the researcher to engage the organisation's employees for the interviews. Participants were given Participant Information forms that detailed the study's goals and objectives, as well as their rights as research participants, which included the possibility to withdraw consent to participate in the study. The interviews were sound recorded with the participants' permission and in accordance with the research protocol. The data was transcribed and stored in a secure password-protected computer to ensure confidentiality. To ensure confidentiality and anonymity, the participants' real names were replaced by pseudonyms. Therefore, codes Participant 1 to Participant 26 were used. Finally, thematic analysis was used to analyse the primary data. Chapter 5 gave thorough details of the coding and thematic analysis process.

7.4 CONCLUSIONS FROM THE EMPIRICAL STUDY

The major findings of the investigation are provided in Chapter 5 of this dissertation. The primary findings were provided in the form of themes that evolved from the study findings. The conclusions drawn from the research are presented in this section. These findings aid in determining whether or not the research questions were answered and the study's addition to knowledge.

7.4.1 Conclusions for research question 1:

What are the current approaches used in the implementation of Green ICT?

Three main conclusions were made on this research question namely practices reducing enterprise-wide-carbon footprint, business attitude towards sustainability and embracing Green ICT for business sustainability.

7.4.1.1 Practices to reduce enterprise-wide carbon footprint

The findings relating to practises to minimise enterprise-wide carbon footprint showed four sub-themes: power management, paper reduction, telecommuting, and procurement and sourcing. Power management was viewed as a low-cost technique for lowering energy use. Paper reduction was proposed as a method of lowering the environmental effect of printing paper. In addition, paper-reduction helped the organisation to reduce the costs of purchasing paper and printing. The large IT company in South Africa prioritised environmentally preferable IT purchasing from a sourcing perspective. This means that the company gave preferential treatment to companies within its supply chain that were compliant with environmental sustainability policies.

7.4.1.2 Business attitude towards sustainability

According to the GITAM model, it was critical for the study to contextualise attitudes and feelings about environmental sustainability. This subject discussed the participants' feelings on climate change and the role of business in environmental sustainability. The survey discovered apparent opposing goals between corporate and environmental sustainability, reflecting conflicted emotions about sustainability. The organization's experts and leaders seem to understand the importance of environmental sustainability and are committed to addressing climate change and corporate responsibility in reducing the negative impact of ICT on the environment. They view Green ICT as a catalyst for promoting sustainability in other sectors of the economy. These views support the earlier claim that Green ICT serves as a facilitator for green initiatives, as demonstrated in the IT-for-green approach. IT-for-green refers to the use of environmentally friendly IT applications that enhance the environmental performance of other sectors by improving energy efficiency and reducing carbon emissions (Esfahani et al., 2018).

The general attitude towards Green ICT among IT experts and business executives at a big South African IT company was favourable towards environmental problems such as climate change and sustainable business operations. As a result, attitude is a primary driver of Green ICT adoption, as professionals and leadership at a large IT company in South Africa envisage a business that embraces objectives of sustainable business development. Some participants, however, stress commercial sustainability over environmental sustainability. According to the findings, the primary motivator for implementing Green ICT inside the firm was a desire for cost-effectiveness. Some participants stated that ideas for Green ICT must first examine cost savings. Green ICT adoption provided potential for a big South African IT firm to cut operating expenses and improve operational efficiency, consequently increasing the organization's competitiveness.

7.4.1.3 Implementing Green ICT for business sustainability

This subject illustrated how Green ICT practises lead to excellent organisational outcomes. One of the important conclusions was that Green ICT practises are primarily focused on either cost reduction or compliance with government rules or consumer and industry expectations. As previously demonstrated, the ability to lower operating expenses is a major motivator for adopting Green ICT practises and technology. This turned into practises for lowering the enterprise's carbon impact through buying and sourcing. In terms of sourcing, it was discovered that the firm prioritises ecologically preferable IT purchase. According to the findings of the study, the company adopts practises that lead to favourable environmental sustainability results from an operations standpoint. These practises include using power management tools on IT equipment to reduce energy waste. According to the findings of the research, the business has made substantial success in implementing Green ICT technology, such as cloud technologies and server virtualization and consolidation. Furthermore, the organisation has been proactive in terms of technological growth. Several noteworthy developments were identified, including a cloud-based document management system that enables digital document signing. This invention demonstrates the company's dedication to minimising paper use and printing.

7.4.2 Conclusions for research question 2

What are the drivers of the implementation of Green ICT within a large IT company in South Africa, South Africa?

Two conclusions were made under this question namely Covid-19 emergency as a catalyst for Green ICT and Green ICT policy.

7.4.2.1 COVID-19 emergency response as a catalyst for Green ICT implementation

This theme addressed aspects of all three sub-research questions, offering perspectives anchored in the context of the COVID-19 pandemic, specifically perspectives on the approach to Green ICT implementation at a large IT company in South Africa during a global emergency response, as well as the barriers and drivers for implementation in the context of a global pandemic. The subject addressed the unanticipated and unwelcome outcomes of company activities. As part of the emergency reaction to the pandemic, governments throughout the world, imposed lockdowns to prevent the spread of the coronavirus. The lockdowns disrupted human economic and social activities, company operations, supply lines, and people's routine everyday lives all around the world, and participants said that their lives were also significantly impacted. The participants explained how the organization's business activities were impacted, including project pausing, project loss, and loss of business clients.

This study's findings are consistent with those commonly published in the literature on the worldwide consequences of the epidemic. The organisation resumed operations as the lockdowns proceeded, although with personnel working from home. During the lockdowns as part of the emergency response to stop the spread of the coronavirus, numerous organisations adopted the work-from-home practise. It was found that the company assisted employees with the transition to remote work. Telecommuting became the norm, with virtual meetings and video conferencing technologies becoming commonplace. Telecommuting provided benefits such as lower operational expenses for fully occupied workplaces such as heating and cleaning, as well as lower on-premises power use. Additionally, because employees could now work from anywhere, productivity rose.

One of the study's primary conclusions was that the COVID-19 epidemic was a crucial element in making the strategic decision to quickly and largely use the dispersed team model. The organisation functions mostly remotely under this strategy. As a result, the firm receives operational benefits such as a smaller office footprint and corresponding cost

savings owing to lower on-premises energy use and utility usage. Furthermore, because employees could work from anywhere, productivity rose. These advantages expedited the organization's policy of reducing its office footprint and incorporating remote work into its long-term sustainability plan. When it was discovered that the dispersed team model was in line with the organization's business sustainability goals, it was adopted as a crucial approach for recovering from the economic effects of the epidemic. As a consequence, the unusual pandemic produced by COVID-19 may be argued to have been an unexpected and unanticipated catalyst that hastened the deployment of Green ICT practises, resulting in beneficial environmental and business sustainability results for the firm.

The widespread adoption of telecommuting has led to positive environmental sustainability results. With fewer people commuting to work, there has been a decrease in carbon emissions and traffic congestion. Additionally, organizations have seen the benefits of downsizing their office space, resulting in reduced energy consumption and utility usage. These changes have not only had a positive impact on the environment but have also yielded cost savings for businesses. In Chapter 2 of the literature review, the concept of telecommuting and a virtual workforce is highlighted as a significant method for businesses to decrease their carbon footprint. This is achieved by reducing electricity usage, minimizing the need for physical office space and utilities, and decreasing carbon emissions caused by daily commuting. (Nica, 2015; Unhelkar, 2016; Tutusaus et al., 2018). As a result, a distributed workforce did cut carbon footprint while also lowering operational expenses.

7.4.2.2 Green ICT policy

The study concluded that the government must play a role in supporting Green ICT. It was discovered in this study that end-of-life policy affected the disposal of ICT equipment. Government legislation, industry, and consumer expectations, as well as the company's cost-cutting and corporate image objectives, influenced the company's Green ICT practises, such as recycling.

7.4.3 Conclusions for research question 3

What are the barriers to the implementation of Green ICT within a large IT company in South Africa, South Africa?

Under this research question, the following conclusion was made:

7.4.3.1 Green ICT policy is not clearly defined

This theme focused on the extent to which green policies are established and implemented throughout the organization's complete value chain in order to determine if the big ICT firm in South Africa has a clear Green ICT strategy. Consideration was given to the three primary stages of the ICT supply chain, including viewpoints on sourcing and procurement, operations, and service, and, ultimately, ICT product end of life. It is great to see Green ICT concerns being used throughout the organization's whole value chain and in the organization's connections with its suppliers. Policy considerations were taken to address environmentally friendly procurement practises. Initiatives to lower the enterprise's carbon footprint are also guided by operational and end-of-service considerations. The study's findings revealed that a significant South African ICT company's approach to Green ICT had an influence on the organization's whole value chain, from its suppliers to its customers.

The organisation's strategy for implementing Green ICT includes partnering with suppliers who satisfy their environmental requirements. In this regard, the adoption of Green ICT inside a significant South African IT firm demonstrates the Proactive green approach. Nica (2015) stated that a proactive green strategy is made up of systemic wits that influence the whole value chain and supplier relationships. Green ICT Policy refers to the frameworks designed and executed by an organisation to apply environmental sustainability principles throughout its value chain (Verdecchia et al., 2017). However, there was also evidence that

the company lacks a coherent strategy or formal policy framework for Green ICT implementation. As a result, an apparently haphazard collection of tactics is employed. The organization's attitude to Green ICT is mostly reactive. Evidence was presented demonstrating that the organisation's strategy for implementing Green ICT is primarily motivated by the need to respond to external pressure to fulfil customers' environmental criteria and government laws, as well as the need to minimise operating expenses. There is no clearly defined uniform structure for execution as a result of the reactive approach.

Despite the lack of a well-defined Green ICT policy, the study discovered that general corporate policies at a big South African IT company have a favourable impact on the application of Green ICT practises. The first topic demonstrated how the strategy to embrace the distributed team model aided efforts to minimise the enterprise-wide carbon footprint through practises such as telecommuting and onsite energy use. The policy also impacts both practises and the technology that enables Green ICT implementation.

7.5 STUDY CONTRIBUTIONS

There are several studies on Green ICT which have employed case study design to explore how organisations are at the forefront of Green ICT innovation. However, most of the case studies are from the developed world, implying that there is a gap in literature for viewpoints from the poor world. This is one of the rare studies that offers viewpoints on a South African organisation. The study, therefore, contributes to the body of knowledge by considering Green ICT implementation in the South African context.

The study's timing corresponded with the COVID-19 pandemic caused by the coronavirus's propagation. When the bulk of research on the COVID-19 pandemic focused on how the IS field responded to the pandemic, this gave a unique chance to explore the effects of a global crisis and the accompanying emergency reaction on Green ICT adoption. One of the important results was that the COVID-19 pandemic triggered an emergency response, which

served as a catalyst for Green ICT deployment at a significant South African IT organisation. This demonstrates that, while a crisis may have severe and damaging effects on human existence, it may also be a suitable time to reconsider human behaviours and implement actions that contribute to sustainability. Insights from such an initiative might influence future practise and assist build resilience into Green ICT deployment amid a natural or man-made emergency response crisis. As a result, the study adds to the body of knowledge on the use of Green ICT practises during times of crisis. The study investigated the organisational reaction to both the pandemic and environmental crises, offering insights into how environmental conditions produced by the crises impact Green ICT uptake. By expanding the applicability of the GITAM model and establishing an interpretative framework for Green ICT, the provides a theoretical contribution.

Since the study was conducted during a time when the COVID-19 pandemic had an influence on organisations, the results show that, while significant, the Green ICT initiatives prior to COVID-19 were incremental but did not produce the radical transformation seen after the pandemic's spread. The findings demonstrate how major shock effects from external environmental events can disturb the mechanisms that underlie resistance to change. These findings are consistent with previous research that investigated the adoption of general ICTs in different industries, resulting in dramatic changes in business models as required innovations to combat the COVID-19 pandemic (Wendt, Adam, Benlian, & Kraus, 2021; Zamani, Griva, & Conboy, 2022).

Furthermore, the findings of the study contribute to the literature on business model adaptation in response to a crisis, notably through the increased adoption of green technology practises. The research reveals the frameworks required to successfully respond to a crisis by implementing Green ICT practises. Using the Gitam model as a guide, a company's Green ICT capabilities and limits may be viewed as the structure that can either support or inhibit the adoption of a Green ICT practise to adapt a business model in response to a crisis. This study demonstrates how the various structures combine to produce an operational strategy shift that coincides with both commercial and environmental goals.

Finally, the research investigates the conflicts of sustainability goals linked with an organisation's many settings and stakeholders. Several environments connected with stakeholders relevant to an organisation may be described, such as from a natural, economic, organisational, social, ecological, and ethical standpoint (Baskerville et al., 2016). The findings reveal that managing sustainability objectives and expectations from various viewpoints is difficult since different views' sustainability goals frequently clash. A frequent example is a conflict between the aims of social, environmental, and economic sustainability.

The case study demonstrates that the pandemic's unexpected impact disrupted various aspects of the organizational, social, and economic environment, which previously hindered the adoption of remote working as an operational strategy. As a result, companies resorted to implementing remote work to recover from the pandemic's economic consequences by reducing costs and improving efficiency. In the long run, this strategy may help achieve environmental and business sustainability goals through the implementation of Green ICT practices. These findings align with prior research suggesting that environmental and economic sustainability objectives are not mutually exclusive (Baskerville et al., 2016). Instead, environmental initiatives can be leveraged to gain a competitive advantage and promote both environmental and economic sustainability (Hankel et al., 2018).

7.6 STUDY LIMITATIONS

The researcher reflected on concerns arising from research design restrictions are considered. This exploratory research concentrated on a single instance organisation. While focusing on a single business provides for in-depth research findings, the study only addressed viewpoints on a single firm, which may not be representative of the prevalent situation in other South African ICT organisations. Furthermore, an exploratory research on a single organisation is constrained by a lack of systematic comparison and analysis, jeopardising the conclusions' generalizability. This study relied on qualitative data. As the study relies on qualitative data, this raises additional drawback. The ensuing analysis makes it difficult to draw precise conclusions that can be objectively summarised. This is due to the

variety of qualitative data, which makes maintaining impartiality in the examination and interpretation of the obtained data challenging.

7.7 RECOMMENDATIONS FOR FUTURE STUDIES

After acknowledging the constraints of this research, this section offers a concise overview of suggested areas for future study that have emerged from the concerns raised in the previous section.

The GITAM model was used in this investigation. While the model is a generally acknowledged and frequently used standardised instrument for objectively assessing organisational Green ICT uptake and capabilities, it is important to note that the model was not designed to fully consider external environmental factors or unexpected events. To improve our knowledge of the pandemic's impact, the study required to depend on TOE and Punctuated Equilibrium theory. Although the COVID-19 pandemic may be a misnomer, other prospective occurrences such as radical technology developments, conflict, poor media coverage, and natural catastrophes may have an external shock impact on organisations and human activities. In the context of such external shock occurrences, future study may examine the maturity and usefulness of the GITAM model. Furthermore, it is questionable if organisational changes linked to the pandemic's external shock impact will persist as the globe recovers from the epidemic. Future studies might, among other things, expand on this research and use the G-Readiness Index as a tool to assess and compare the organisation's Green ICT capabilities and limits with other organisations in the industry. Future research should also look at which organisational improvements will last and what mechanisms prevent businesses and people from reverting to pre-COVID-19 practises.

7.8 CONCLUSION

This chapter summarises the research by summarising the findings. The study is based on the rising relevance of examining sustainability issues in the field of information systems, with an emphasis on Green ICT as one area of responsible IS research. The study's goal was to create and assess Green ICT implementation guidelines with an emphasis on big organisations, using the case of a large South African ICT company as a case study. The research used the GITAM model as a theoretical lens to analyse the Green ICT organisational capabilities and constraints of a multinational ICT company in South Africa.

The study established that Green ICT implementation aspects are primarily responsible for the organization's capabilities. Cost reduction and the desire to increase operational efficiency and resource utilisation were two significant motivations in the organisation. External pressures include regulatory obligations, consumer expectations, and industry standards, all of which place pressure on the company to integrate environmental sustainability issues in its corporate image plan. As a consequence of these critical aspects, the organisation established technological skills and ICT infrastructure that incorporates environmental sustainability concerns throughout the whole system and across the full life cycle of ICT products. Employees are encouraged to contribute to sustainable results, and sustainability is also addressed in client and supplier partnerships.

Despite these good findings, the investigation discovered that the company lacks a cohesive and comprehensive Green ICT policy. Due to the lack of a coherent model detailing environmental goals, this shows to be the most important risk to successfully integrating Green ICT in the firm. A thorough strategy would also specify roles and duties for green projects, as well as provide accountability structures and procedures for assessing sustainability KPIs. One of the most important contributions of this study was the ability to investigate the effects of a worldwide catastrophe and the ensuing emergency reaction to the COVID-19 pandemic on Green ICT deployment. In the example of the big South African ICT firm, the study concluded that the COVID-19 pandemic triggered an emergency reaction

that served as a catalyst for Green ICT deployment. The emergency response necessitated the rapid implementation of the dispersed teamwork model, which is an essential component of the organization's Green ICT capabilities. The findings demonstrate that remote work, as a long-term practise, aided in the development of organisational resilience throughout the epidemic. The report presented a framework for Green ICT deployment. Future study might look at the implementation of Green ICT policies in both commercial and governmental institutions, using quantifiable key performance indicators. This will help to establish South Africa's progress in terms of Green ICT compliance.

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APPENDICES

APPENDIX A: THEMATIC CODING AND CODE GROUPS

Code		Code groups
Business attitude	Concern about climate change, Concern about reducing ICT's power usage, Concerns about sustainable development, competing priorities, lack of expert knowledge, ROI of Green ICT, resistance to change, lack of education and awareness	Challenges
Challenges: Governance	Lack of enforcement, Lack of Metrics for assessing the impact of Green ICT, Lack of organisational culture of environmental sustainability	Challenges
Challenges: policy	No clearly articulated policy	Challenges
COVID-19-related challenges	Adjusting to remote work, Delayed projects, Difficult to monitor employee Green ICT practices, Disruption of business and Supply chain constraints	Challenges
Drivers	Covid: Change attitudes, Covid: Response to emergency, Education and awareness, environmentally conscious peers, environmentally conscious peers	Drivers
Governance drivers	Corporate social responsibility, Cost reduction, Improve Value offering for green Businessclients, Industry standards, Regulations, Governance: Allocation of budgetary and other resources forGreen IT	Drivers
Green ICT IS	Enabler for green Initiatives, increases the positive impact of ICT on the environment, minimises the negative impact of ICT on the environment	IS
Green ICT policy	Downscale office footprint, end of life, green recovery, sourcing	Green ICT policy

Green ICT practices	Initiatives to reduce enterprise-wide carbon footprint, Initiatives to reduce energy consumption, End of life practices	
Solutions	Change management, Education and awareness, Expert knowledge, Organisational culture, Recruitment, Upskilling, Allocation of budgetary and other resources, Enforcement of rules and regulations, clearly defined roles, responsibilities, accountability and control for Green IT initiatives, Cloud Technology, Virtualisation	

APPENDIX B: RESEARCHER DECLARATION

RESEARCHER DECLARATION

Hereby I, Isaac Muranganwa (19382317) in my capacity as a Master's student (MIT) (IS) in the Graduate School of Technology Management, University of Pretoria, that:

- 1 Research subjects will be informed, information will be handled confidentially, research subjects reserve the right to choose whether to participate and, where applicable, written permission will be obtained for the execution of the project (example of permission attached).
- 2 No conflict of interests or financial benefit, whether for the researcher, company or organisation, that could materially affect the outcome of the investigation or jeopardise the name of the university is foreseen.
- 3 Inspection of the experiments in loco may take place at any time by the committee or its proxy.
- 4 The information I furnish in the application is correct to the best of my knowledge and that I will abide by the stipulations of the committee as contained in the regulations.

5 Signed: Isaac Muranganwa

Date: 20-04-2021

APPENDIX C: PARTICIPANT INFORMATION LETTER

Dear Sir/Madam,

I am a Master's student in the Graduate School of Technology Management, University of Pretoria.

My research titled **FACTORS INFLUENCING THE IMPLEMENTATION OF GREEN ICT IN LARGE ENTITIES; A CASE OF ABC, SOUTH AFRICA** is about the implementation of Green ICT.

My study aims to determine the factors that determine the successful implementation of Green ICT and provide an assessment of the implementation of Green ICT by ABC and further identify means, and solution towards ensuring the best practices in Green ICT by the organisation as well as enhancing its contribution towards a green economy.

The purpose of this questionnaire is to gather information about your experiences, views and beliefs concerning environmentally friendly computing (Green ICT).

You were chosen as a respondent because of your use of ICT in accomplishing your work.

Your participation is voluntary, and you can withdraw at any time without penalty. Throughout the survey your privacy will be protected and your participation will remain confidential. I do not wish to analyse data individually and all the data will be transferred to a computer programme to analyse the entire group. This means that you are assured of anonymity.

If you agree to participate, please kindly to the question below with a X in the box next to "Yes, I am available", indicating that you are available. By responding to my email with a "Yes", you indicate that you voluntarily participate in this research. If you have any concerns, please contact me with the detail provided below.

Researcher name: Isaac Muranganwa

Email: u19382317@tuks.co.za

Phone: 0765725684

Responded no ...

Question 1: Do you choose to Voluntarily participate in this research interview?

By answering "Yes" to this question, I hereby voluntarily grant my permission for participation in this anonymous interview. The nature and the objective of this research have been explained to me and I understand it.

I understand my right to choose whether to participate in the research project and that the information provided will be handled confidentially. I am aware that the results of the interview may be used for academic publication.

Yes, I am available

No, I am not available

APPENDIX D: SEMI-STRUCTURED INTERVIEW GUIDE

Research Topic:

FACTORS INFLUENCING THE IMPLEMENTATION OF GREEN ICT IN LARGE ENTITIES; A CASE OF ABC, SOUTH AFRICA.

Course	MIT (IS) University of Pretoria
Student	I Muranganwa (u19382317)
Email:	u19382317@tuks.co.za
Phone:	0765725684

Research Interview Questions (about 1hr)

Participant number

Question 1: Do you choose to Voluntarily participate in this research interview?

By answering "Yes" to this question, I hereby voluntarily grant my permission for participation in this anonymous interview. The nature and the objective of this research have been explained to me and I understand it.

I understand my right to choose whether to participate in the research project and that the information provided will be handled confidentially. I am aware that the results of the interview may be used for academic publication.

Question 2: How long have you been working for ABC?

Question 3: What is your role in ABC?

Question 4: What are your day to day activities in ABC?

Question 5: How do you use ICT within ABC?

Question 6: Does your role allow you to influence ICT Policies within ABC?

Question 7: What do you understand by Green ICT and how is it viewed with your organisation?

Question 8: What is the importance of implementing Green ICT within your organisation?

Question 9: Which strategy do you use, if any, in implementing Green ICT within your organisation?

Question 10: How does Green ICT relate to the overall strategies of your organisation?

Question 11: What are the Green ICT practices you have implemented? Why?

APPENDIX E: RESEARCH APPROVAL



Faculty of Engineering,
Built Environment and Information Technology

1956 – 2016
60
years of
Engineering Education

10 March 2021

To whom it may concern

Research proposal approved: Mr Isaac Muranganwa

Mr Muranganwa (Student nr. 19382317) is registered for MIT (IS) at the University of Pretoria.

Supervisor: Prof Rennie Naidoo

Research topic is: Factors influencing the implementation of green ICT in large entities; A case of ABC, South Africa.

I herewith confirm that Mr Muranganwa research proposal has been approved. He may continue with the planning of his data collection, as well as his ethics application.

Kindest regards



Prof C de Villiers
Acting Head of Department: Informatics
012 420 3798
Rhona.vandermerwe@up.ac.za

APPENDIX F: ETHICAL CLEARANCE LETTER



Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en
Inligtingtegnologie / Lefapha la Boetsenere,
Tikologo ya Kago le Theknoloetši ya Tshedimošo

7 May 2021

Reference number: EBIT/31/2021

Mr I Muranganwa
Department: External department
University of Pretoria
Pretoria
0083

Dear Mr I Muranganwa

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Approval is granted for the application with reference number that appears above.

1. This means that the research project entitled "FACTORS INFLUENCING THE IMPLEMENTATION OF GREEN ICT IN LARGE ENTITIES; A CASE OF ABC, SOUTH AFRICA" has been approved as submitted. It is important to note what approval implies. This is expanded on in the points that follow.
2. This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Research Ethics Committee.
3. If action is taken beyond the approved application, approval is withdrawn automatically.
4. According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.
5. The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

A handwritten signature in black ink, appearing to read 'Kai-Y Chan'.

Prof K.-Y. Chan

Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY