A Study of Green IT Technology

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Abstract *— Each year the global production and development of computer systems increases, this in turn increases the energy demand that these systems require to function. Information technology has a role to play in the ever-increasing energy industry and it should be handled in a sustainable manner by applying the concepts of Green IT. This paper looks at current research oriented towards green technology's and methodology's, such as solar energy, cloud technology and thin-clients, and how they are being applied in computation. We consider the use of renewable energy sources and apply the concepts in a theoretical context towards the energy consumption of a local IT company and design the basics of a solar energy system to offset their high season demands.*

Key Terms *— Green IT, Information Technology, Solar, Sustainability.*

INTRODUCTION

Green IT is a rapidly growing field focusing on the creation of environmentally friendly computational practices with the goal of minimizing the environmental impact the IT world has on the planet. According to Forbes [1] the IT industry is one of the fastest-growing industries in the U.S. due to the reliance of every other industry for IT services which creates demand. Some of the fields that are part of this growth [2] are wireless networks infrastructures, the "Internet of Things", smart technology, data centers, healthcare, virtual reality and security oriented technology. This growth means energy spending and consumption will continue to rise and which contributes to the problem of global warming. This project aims to review past and current research oriented towards the sustainability factor of computational systems. It focuses on newer technology's and paradigms such as cloud computing and thin-clients as possible alternatives and the use of renewable energy sources.

The first section of this paper attempts to define the concept of Green IT based on current research being done on the field and how awareness plays a key part in educating the public towards a green mindset. The second section will delve into energy consumption and how data centers are one of the focus areas for Green IT research as they are one of the least environmentally friendly technology's that currently exist. The third section focuses on solar energy as an ideal renewable energy source for the IT field. The forth section explores advantages and disadvantages of cloud and thin-client technology's as alternative means that can be oriented towards sustainability. The final section studies the energy consumption of a local IT company and by doing a theoretical analysis we design the basics for a solar energy system aimed to offset the energy consumption for their high season.

DEFINING GREEN IT

As it currently stands Green IT, also known as Green Computing, can be defined in different ways depending on the specific area you target when defining it. It is a field born from the current concerns regarding Global Warming and the increasing dependency of computer systems. [3] Green IT is described as a field that incorporates two trends: A) the growing concern about environmental issues across many human communities and B) the use of digital tools and techniques for manipulating information and the social phenomena that surround these systems. [4] Another definition is that Green IT is comprised of initiatives, strategies, solutions, and information technologies that reduce the environmental impact of IT. [5] Simplifies the definition to creating an environmentally sustainable computing system that is economically viable and

energy consumption friendly while improving performance and use. Unhelkar mentions in his book [6] that Green IT has six drivers that motivate businesses to adopt a more environmentally friendly approach. Figure 1 illustrates these drivers.

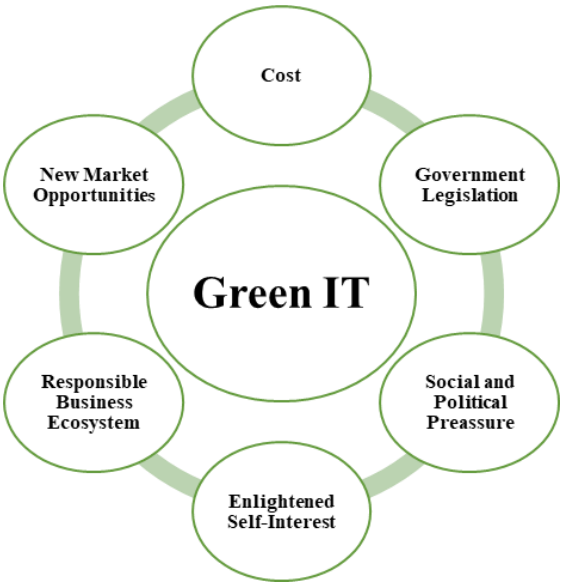

Figure 1
The Six Drivers of Green IT

Looking at these definitions we can determine that Green IT incorporates various topics within the real world such as environmental issues, economics, politics, social tendency's, industry trends and technology. For this paper Green IT will be defined as, the approach of using environmentally friendly processes when interfacing with IT in order to minimize or control the effect of technology to the environment. Interfacing meaning to create, adapt, transform or migrate any new or existing IT system.

Green IT Awareness

While companies might have policies in place and internal campaigns to promote a greener focused goal for employees it is not the same when thinking of home users and schools. A typical household in 2017 might have between 2 – 4 desktops or laptops, not to mention tablets and mobile devices. Most of the time these devices are left turned while not in use, sometimes even overnight or while not in the house itself. Research done by [7] focuses on home computer power management, general user usage and the potential energy savings that could be achieved. Their research found that most general home users, even those who are more tech savvy, do not put their computer on low power modes or shut them down when not in use. Reasons for this are varied but two that stand out are the lack of technical knowledge of how to change these settings, and impatience from users and the need to have a computer ready for use (long boot times). In this specific study, it was found that computers are being used less than a ¼ of the time than they are actually powered on. The most important result from their research however was that energy saving amounts for little monetary savings compared to the

Another study done by [8] detailed the printing practices of Lehigh University, which promoted free printing for students and faculty and counted with a student population of 6,600 in the year 2008. In this research an application called PaperCut, which is a print management solution, was installed on some of their campus labs to gather data on the printing habits of student population. Their results from this gathering highlighted that while most students print an acceptable number of pages, 20% overuse the printing privilege all together. They approached the problem by making a successful awareness campaign highlighting the printing problem which included a video presentation to highlight the effect of over printing was having.

Awareness on its own is a good initiative but it does not guarantee that change will happen which is why most schools and universities either have a maximum quota of printing per student or charge for printing altogether. This forces students to be more mindful of their printing knowing that the pages come from there on budget. In the case of home users having the technology to save energy available does not guarantee that they will use it especially when the current trend in a fast-paced society is to have everything ready at any moment.

ENERGY CONSUMPTION

Energy consumption is one of the leading areas where Green IT is currently trying to be

implemented in. According to a study done in 2012 by [9] Information and Communications technology consumed 4.7% of the global electric energy. This can be broken down to 1.5% from data center, 1.7% from communication networks and 1.5% from personal computers. In the U.S. in 2014 data centers consumed 2% of the total energy that was produced [10].

The cascade effect of dealing with problems higher up in the priority chain can result in lowering energy consumption overall. For example, assume a company decides to consolidate various data centers because they notice an under usage in certain sectors and could remediate by combining resources from two facilities. This will eliminate one facility completely which on its own saves energy. This can further be optimized by properly managing data center servers which [9] explains seems to be one of the factors for lack of optimization.

An analysis done by [11] which focused on the utilization rates of data center determined that they are not as efficient as they could be in modern computation because they are most of the time being underutilized. The paper explains that a data center is often built to fit a future demand, rather than a present one. This means that if you currently produce 1Terrabyte of information then a data center that is currently being created should accommodate for several projected years of information, but you also need to account for the growth that can occur after that.

Because of this way of building two key problems are generated, which are server sprawling and orphan servers [11]. The first problem deals with the bad practice of adding servers instead of utilizing existing servers to consolidate and optimize usage and therefor freeing up other servers for other use. The main point here lies in that by adding more servers you are adding to the energy consumption while consolidating and reallocating current resources can yield the same result with better energy savings. The second problem deals with having a sever running without it being utilized, which on its own is just consuming energy unnecessarily.

RENEWABLE ENERGY

One important aspect when trying to go green is to pick a renewable energy source that is sufficient for the specific tasks for which it is needed. Although different sources exist such as wind energy, hydropower energy and geothermal energy, the more commonly used by companies and homeowner is solar. The main advantage of solar energy is its availability as it is the most abundant energy on the planet [12]. The other advantage of solar energy is scalability as a small system can be built and added upon slowly, depending on the energy need.

In [13] an experiment using a photovoltaic system equipped with energy storage components was done on a micro-data center. They compared two difference types of configurations to see which would be more efficient is reducing energy costs for the data center. The results from this experiment were encouraging as they resulted in a 75% reduction to energy costs for the micro-data center.

GREEN ORIENTED TECHNOLOGY'S

We consider two different types of technology that have been used as solutions or alternatives in Green IT. These technologies are cloud computing and thin-client computing.

Cloud Computing

[14] defines cloud computing as a *"paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand."* [4] refers to cloud computing as a "*promising approach to use the computation and storage resources and communication technologies in energy efficient manner with improve utilization of data center.*" As it currently stands cloud computing is a good alternative for small and medium size businesses in terms of initial cost. Since the burden of purchasing server equipment, software licenses, installation and management are done by the service provider it is a good incentive to creating a data center from scratch [11]. When it comes to large companies however deeper thought needs to go

into making the jump to cloud as they will most likely have a complex data center structures and must carefully evaluate if the switch will be overall beneficial in the long run. Figure 2 illustrates the basic diagram of a cloud platform.

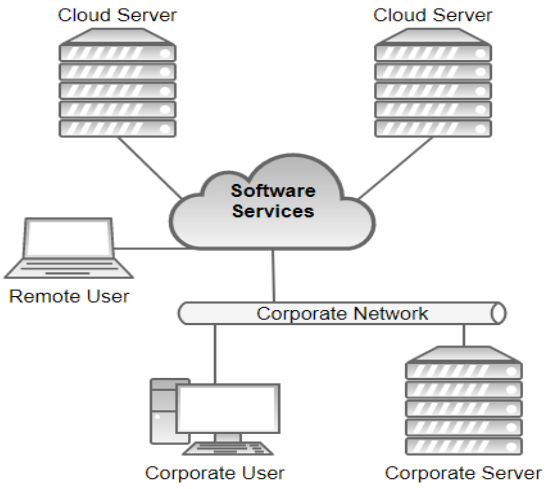

Figure 2
Cloud Computing Diagram

As with any technology cloud computing has its advantages but also has its set of challenges and concerns that require to be careful when utilizing it [4][11]. Agree that the main advantage is energy saving via the means of virtualization which improve server utilization rate which add up to lower operating costs. This translates to one server doing multiple operations as opposed to having multiple servers doing one operation which increases the utilization rate. They also agree that management, which is a big factor in data center optimization, is greatly simplified since less servers are used. Other advantages are scalability since the cloud can be expanded on rather easily without the need to add more hardware from the user's side.

The cloud platform has its sets of "disadvantages" which are more like challenges and concerns [11] that should be taken into consideration when deciding to opt for this technology. The primary disadvantage that is of concern is security of a cloud platform since the stored data is in a remote location or shared across multiple locations. Another concern that goes in hand with security is the privacy of the data which could be at risk since many clients could use the same cloud platform and accidently get access to it [4]. Regulation is another challenge since laws pertaining to the cloud are still in development. The last two challenges are reliability and compatibility. Even thou these challenges and concerns exist they are often overlooked because it is the cloud provider who needs to take care of them.

Thin-Client Computing

Thin-Clients are a technology used in sever-based computing; they are essentially simple computers, typically with small form factors and basic hardware necessary to handle input, output, storage and connectivity operations. Server-based computing is a computational methodology in which all operations run in a centralized server or server's and are accessed by thin-client computers [15]. Thin-clients consume less energy than their PC counterparts which makes them very desirable for Green IT. In [15] it is shown that thin-clients can use 85% less power than a desktop and costing only ¼ of the price to power. Figure 3 illustrates the basic of a thin-client platform.

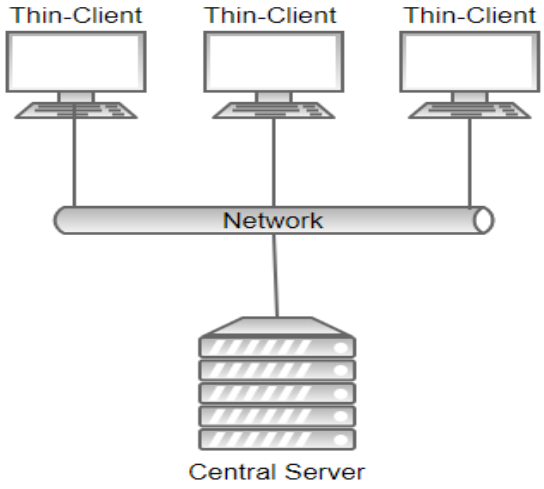

Figure 3
Thin-Client Diagram

This type of computation is advantageous because it offers a great deal of control. In [16] thin-clients are described as "centrally managed" and offer the advantages of easier software access and license management because every client will get access from the central server instead of having to

install software on every individual client, better control of applying updates and upgrades because only the central servers will require it and lowering costs because instead of getting fully powered PCs a less expensive thin-client is used. Another advantaged mentioned in [16] is that a thin-client requires basically no support and if a unit stops functioning it can simply be replaced without the need to invest in extracting data from it.

As with any technology thin-clients also have its disadvantages. First, we take into consideration the concept if availability on this type of platform. In a scenario when only one central server is used if the server goes does than no one will be able to access their applications, files, etc. This can be remediated by using a small cluster of servers to act as backups for this type of situation. Next, we take into consideration security of a thin-client. In [4] it is stated that they are susceptible to several security threats such as access control. Since all data is in a central server it makes it easier for an attacker to conduct a specific centralized attack that could cripple the system. Lastly, [4] also takes into consideration the concept of authentication and encryption in a thin-client which states that some clients lack this very important security measure. Overall these disadvantages can be handled be investing in a good security system and establishing security the appropriate protocols to counteract them.

CASE STUDY: DXC TECHNOLOGY PUERTO RICO

DXC Technology Puerto Rico is delivery center of DXC Technology, an end-to-end IT services company. This delivery center is located in Isabela, PR and currently counts with more than 500 Employees housed across two buildings that have not been outfitted with solar energy to this day. However, this delivery center has made efforts to adopt a Green mindset. For example, they embrace the "go paperless" way of thinking, incorporate water saving installations to both collect and use rain water for general usage in their facilities. They also encourage carpooling and the usage of emission friendly vehicles. As part of their business continuity strategy they have diesel generators installed in case of any power outages. Although I was not able to get specific information about how much power their IT related services consume we can make an estimate based on the profile of the company. All employees are assigned either a desktop or laptop for work depending on their area, but the majority use laptops so they can work from home. Each employee is also assigned a desk with a docking station and a monitor. The company houses several servers, but the exact number of this is also unknown. Because of the nature of what they do I will assume that at least 60% of the energy consumed comes from IT related services.

Solar Energy System Estimates

For this project the facilities manager for the Isabela delivery center was contacted and provided energy billing information for the period of over a year. The intent is to use this information to make semi-accurate cost savings projections that would result from incorporating Solar Energy into one of their buildings. The raw data that will be used is illustrated in Table 1 and consists of the energy bill date, the kilowatt-per-hour (kWh) consumed, the total that was charged and how much was charged by kWh.

Table 1
Energy Spending Raw Data

Bill Date	kWh Consumed	Bill Total	Cost per kWh
11/17/15	79,200	$16,994.17	$0.21
12/16/15	65,340	$11,654.88	$0.18
1/15/16	62,700	$10,903.90	$0.17
2/16/16	68,640	$12,363.98	$0.18
3/16/16	64,680	$10,950.02	$0.17
4/15/16	74,580	$12,889.90	$0.17
5/16/16	75,900	$12,669.62	$0.17
6/15/16	77,220	$13,757.36	$0.18
7/15/16	77,220	$13,650.46	$0.18
8/15/16	81,840	$14,831.90	$0.18
9/14/16	71,280	$14,641.43	$0.21

The average values for this raw data were also calculated and are illustrated in Table 2.

Table 2
Energy Spending Average Calculation

	kWh Consumed	Bill Total	Cost per kWh
Annual Average	72,600	$13,209.78	$0.18

In Figure 4 we can see the how energy costs are lower during November up until March, we will call this low season, and then start to spike from April up until September, we will call this high season. This is consistent with business process that views much of its primary workload during the summer and starts going down the closer we get to the fall and winter months.

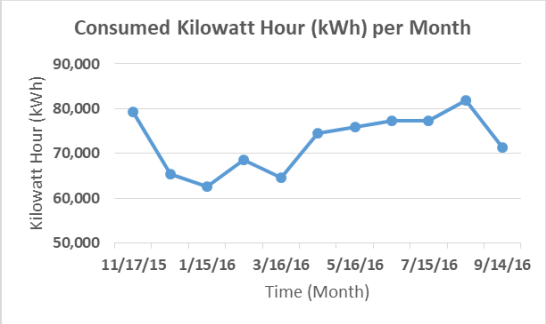

Figure 4
Graph of Consumed Kilowatt Hour (kWh) per Month

Applying concepts from the Solar industry we first aim to fix the gap between high season consumption and low season consumption by deploying Solar technology to take the bulk of the usage during high season which is also when the most sunlight hours are available on the island. This would be a good proof of concept to determine if solar energy really is a viable and effective solution for the company because after the initial investment it can be expanded upon to meet the rest of the energy needs. The theoretical target is to offset the amount of kWh produced from the difference between the high season and low season. Since the information provided is not from long term we will define high season and low season with a set of 4 data points each and calculate the average kWh and cost for them. Table 3 illustrates these data and results.

Table 3
High Season vs. Low Season Data

Bill Date	kWh Consumed	Bill Total	Season
12/16/15	65,340	$11,654.88	Low Season
1/15/16	62,700	$10,903.90	
2/16/16	68,640	$12,363.98	
3/16/16	64,680	$10,950.02	
4/15/16	74,580	$12,889.90	High Season
5/16/16	75,900	$12,669.62	
6/15/16	77,220	$13,757.36	
7/15/16	77,220	$13,650.46	
Averages for Low Season		**Averages for High Season**	
kWh	Cost	kWh	Cost
65,340	$11,468.20	76,230	$13,241.84
Difference in kWh		**Difference in Cost**	
10,890		$1,773.64	

To make an estimate of how large the solar energy system should be and how many solar panels should be used information from [17] will be used as the basis for the estimate. Although the estimates provided are targeted towards home systems they can also serve as a basis for an industry system. For this particular case we need a system that can offset 10,890 kWh. According with the information provided a 10kW solar energy system would be the necessary size to offset the difference. A 10kW system is able to produce an average of 14,165kWh annually. This system would consist of approximately 40 solar panels.

Pricing for solar energy systems are not easy to determine as they vary depending on the company that does the installation, the materials used, the size of the system and many other factors [18] provides us with average cost for kW produced from a solar system within Puerto Rico. The cost is between $3.50 and $4.50 per Watt. Using this information on the estimated above system we can determine that a 10kW system would range somewhere between $35,000 and $45,000.

Now that we have an estimate base investment amount for a solar system we need to take into considering if the investment of the solar system is worth performing. Solar systems are usually payed over a set period of years, so we will do calculations for a 20-year payback period. First, we take into consideration how much we would pay the electric company over 20 years. We want to use the solar system to pay off the difference between high and low season which in this case is $1,773.64 per month, which projected to a 20-year period (240 months) would add up to $425,674. Equation 1 illustrates these calculations.

$$Spent\ Cost = Generated\ per\ month * Months$$
$$= \$1{,}773.64.00\ per\ month * 240\ months$$
$$= \$425{,}674.00 \quad (1)$$

Next, we calculate how much money the 10kW solar system would generate per month which is $2,408 per month, which projected to a 20-year period would add up to $577,920. Equation 2 illustrates these calculations.

$$Generated = Generated\ per\ month * Months$$
$$= \$2{,}408.00\ per\ month * 240\ months$$
$$= \$577{,}920.00 \quad (2)$$

If we calculate the difference we can estimate savings of $152,246 over a 20-year period, which is approximately $635 per month. This is a 30% savings amount. Equation 3 illustrates the percentage difference (PD) calculation.

$$PD = \frac{|\Delta V|}{\frac{\sum V}{2}} * 100$$
$$= \frac{|\$577{,}290.00 - \$425{,}674.00|}{\frac{(\$577{,}290.00 + \$425{,}674.00)}{2}} * 100$$
$$= \frac{152{,}246.00}{501{,}797.00} * 100 = 30.34\%\ difference \quad (3)$$

Assuming we want to pay off the solar system as at a 20-year period we can estimate that it'll cost $145 per month, this is without including any extra fees or taxes. If we divert the monthly energy saving to the direct payment of the solar panels then the system could be paid off in about 4.5 years. This of course is very unlikely and will probably be paid off at the normal rate over the 20-year period.

Cloud Service Estimates

We now look at how much potential savings that switching to a cloud platform would offer. We will base this section on the Citrix Cloud platform. This platform [19] is a simple, fast, flexible and secure way to delivery and manage Citrix technology's. It is able to support virtualization of Windows and Linux environments, give access to Citrix based tools, support and compatibility for Windows applications. It also offers file syncing and sharing, networking security.

From the information available the Citrix Cloud platform is divided into various subscription plans that vary depending on what a user or a company requires. For this project we will derive estimates based on the best value subscription called Citrix Workspace Service. This subscription includes all the Citrix Cloud services, including virtualization, enterprise mobility management, file sync and sharing and network. The pricing for this subscription begins at $28.17 per user per month on a 3-year subscription. Table 4 illustrates results for projected pricing for 500 users.

Table 4
Citrix Cloud Platform Estimated Pricing

	Cost in USD
Monthly/Per User	$28.17
One year/Per User	$338.04
One Year/Cost of 500 Users	$169,020.00
Cost for 3-year subscription	$507,060.00

Because we do not have information regarding the current infrastructure of DXC Puerto Rico we cannot make estimates of how much savings they would receive from switching to a cloud platform. However, based on [20] we can assume that savings will be between 15% - 35% over a 3-year period. For this particular case savings should not be expected to be above 20% as the delivery center counts with its own infrastructure and the cost of switching would be great.

Thin-Client Estimates

We now look at how much integrating a thin-client structure for DXC Technology Puerto Rico would amount to savings. For this we take insight from [15] as they have previously illustrated how to calculate possible savings for thin-client infrastructures. Equation 4 illustrates the formula to calculate power consumption for a computer.

$$n * p * h * 52 = kWh\ used\ per\ year$$
$$where\ n = number\ of\ devices$$
$$p = power\ in\ kW\ device\ uses$$
$$h = number\ of\ hours\ device\ is\ on\ per\ week$$
$$and\ 52\ is\ the\ number\ of\ weeks\ in\ a\ year \quad (4)$$

Most of DXC Technology operates with laptop devices, instead of desktops so we will base estimates based on the model they typically use, however for security concerns the model will not be disclosed. We will also use a thin-client from Hewlett-Packard [21] for comparison. Table 5 illustrates this data.

Table 5
Laptop vs. Thin-Client Device Summary

Device	Single Unit Watts	Watts for 100 units	Watts for 500 units	Price per Unit
Laptop	130 watts	13,000 watts	65,000 watts	$750.00
HP t420	45 watts	4,500 watts	22, 500 watts	$245.00

Now we apply the formula to these specifications. For the laptop device we set n = 500 devices, p = 0.13kW, h = 50 hours. This results in 169,000 kWh per year. Doing the same for the thin client we set n = 500 devices, p = 0.045kW, h = 50 hours. This results in 58,500kWh per year. We can now apply percent difference to obtain a 97.14% difference in the amount of kWh produced by each type of device per year. Equation 5 illustrates the percent difference calculation.

$$PD = \frac{|\Delta V|}{\frac{\sum V}{2}} * 100$$

$$= \frac{|169000\text{kWh} - 58500\text{kWh}|}{\frac{(169000\text{kWh} + 58500\text{kWh})}{2}} * 100$$

$$= \frac{110500\text{kWh}}{113750\text{kWh}} * 100 = 97.14\%\ difference \quad (5)$$

We can also apply similar calculation to get the pricing for the 500 units of each type of device. For the laptop device this would be an investment of $375,000 and for the thin-client it would be an investment of $122,000. This is $253,000 in savings. We can also use the average cost per kWh from Table 1 and the results from the kWh used per year to calculate the amount of power consumed per year. For laptop devices we take $0.18 kWh and multiply it by 169,000 kWh from the 500 devices. This results in $30,420 to power the devices. The same applied to the 500 thin-clients consuming 58,500kWh would result in $10, 530 which is approximately $20,000 in savings just from energy consumption.

The previous estimates are based solely on the thin-client machine and not the server infrastructure that it requires to function. It is important to remember that thin-clients come in difference form factors, and specifications. In some instances, they may even be more expensive than a desktop. They should be carefully considered and studied to determine the real business need and if it's the correct technology to use.

Paperless Office Estimates

DXC Technology Puerto Rico already counts with a "Go Paperless" campaign and has been promoting it for the past 3 years. For this project we do not have data on paper consumption of the company, but we can make theoretical estimates. Let us say 500 employees consume 25 papers per week, this results in 12,500 papers consumed. Assuming we want to be an environmentally friendly as possible we go we a 100% recycled ream of paper valued at approximately $15.00 for a 500 pack which results in buying 25 reams. Each paper cost's approximately $.03, this multiplied by 12, 500 adds up to $375 in papers. If we project this to 52 weeks (1 year) we determine that we spent $19,500 on paper. By altering the number to just consuming 15

papers per employee per week and projecting in to 52 weeks we determine that we spent $11,700 in paper. Applying the percent difference equation, we can determine that this is a 50% difference and saves approximately $8,000.

These estimates show that although paper consumption may seem like a meaningless material that doesn't contribute to big costs in the long run it does add up to meaningful spending. In a company setting this may be somewhere from 1% to 3% of the budget, but if it can still be reduced then the opportunity can be explored.

RESULTS

Table 6 list the results from this case study in terms on savings in currency and percentages. The results are provided as to show with clarity how each Green approach compares with each other.

Table 6
Savings Results per Technology

	Savings in Currency	Savings in Percentages
Solar	$152,246 over a 20-year period $635 per month	30.34% 1.5% savings per year
Clod Platform	Relative to infrastructure	15% - 35% over a 3-year period
Thin-Clients	$20,000 savings from energy spending $253,000 savings from devices	97.14% savings from initial startup investment
Paperless Office	Approximately $8,000 over a one-year period	50% savings per year

Expanding in these results we can determine that solar, in most cases would not be a viable solution unless the initial investment has already been accounted for and is available. We need to remember that the solar system estimated in this project is meant to absorb the cost of the high-low season difference. If we were to apply it to the entire infrastructure then the initial investment will be very high, most likely surpassing $100,000. The 30% savings that we see can be divided into the 20-year period that would amount to a 1.5% I savings per year. Which

For the cloud platform we are not able to calculate a dollar amount since we do not have information on the current infrastructure that DXC Technology Puerto Rico for a direct comparison. The percentages given are based on savings reported by Forbes but should be taken with a grain of salt. We do not think that this delivery center could get a 35% savings reduction from adopting cloud which is why a range of savings percentage was given. More than likely the savings would be much lower, even going below 15%. If the implementation to cloud were done by a starting company with no current infrastructure, then savings could be considerably significant.

Thin-client is easier to compare as we just need to compare how much a device consumes in terms of power and then extrapolating dollar cost. It is also easier to determine how much of an initial investment would be needed to purchase a large number of devices. Although the savings in percentage can seem significant at 97%, they are not necessarily so. This number is just for the thin-client device, not that actual server infrastructure behind it that although shouldn't be as high in cost, would still amount for more than the thin-clients cost, especially if the infrastructure needed is designed with the idea of having a system that can be clustered in order to prevent a full outage. For a thin-client the investment will go in setting up a reliable virtualization server environment.

Paperless office is also easier to compare as estimates can be extrapolated rather easily. We determined a 50% savings by going "paperless". In this we just reduced the amount of paper consumed per employee for a 1-year period. These results can very since not all employees use the same amount of paper. However, we need to remember that paper and ink are usually a small part of the budget of any company so even though the results seem high it is a minor part of the savings of an overall budget since the bulk of the budget would go to IT related services and infrastructure.

CONCLUSION

Green IT is a field of opportunity. It opens the possibility to invest in sustainable computing method's that at the same time meet consumer and industry needs. Savings, no matter how small all add up in the end. The more green technology's and methodology's that are utilized the more savings that can be expected. The main problem lies in that many computational systems are already well stablished and changing them to a greener form is difficult, however this has not stopped companies like Google, Dell, General Electric and many others to make the change.

Currently, the top 2 Green IT technologies are Cloud computing and Thin-Clients. They offer the most scalability and the best pricing with the most minimal investments. They are easier to setup and support and provide versatility with the ability to incorporate different types of system, applications, operating systems, etc. For small and medium size companies these approaches can be very valuable and even large-scale companies have opted to incorporate these technology's even if in a minimal capacity.

ACKNOWLEDGMENTS

I would like to acknowledge Dr. Jeffrey Duffany for his contributions and guidance during this project. It was a long road, but he was always willing to get me through it and provide his support.

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