GREEN ICT (INFORMATION AND COMMUNICATION TECHNOLOGIES): A REVIEW OF ACADEMIC AND PRACTITIONER PERSPECTIVES

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ABSTRACT
People have needed to reach information day by day when information technologies have been participated in our life. This creates some demands about meeting Software & Hardware requirements increased with parallel. Especially, increasing in hardware needs which are about software systems, cause production of more powerful systems. These powerful systems have caused bigger size of footprints day by day. Especially in our era, we need to take some precautions about global warming with making these footprints smaller. That is the reason why Green Information and Communication Technologies have been defined by engineers to create some solutions to decreasing these footprints and meet companies requirements with using high engineering and its green approaching solution ways. Green Information and Communication Technologies have been investigated by academicians and Practitioners' Perspectives.

Key Words: *Green Information and Communication Technologies (ICT), Green ICT sustainability*

JEL Classification: O30

1. INTRODUCTION

The new important issues for enterprises, governments, and societies are caring environmental issues and adopting environmentally sound practices. Information Communication Technology (ICT) is a good way to reach this outcome because it improves our overall energy productivity while maintaining a high quality of life and dynamic economy. ICT provides many benefits to the society. First of all, it decreases the energy needed to design, manufacture, and distribute the ICT devices and equipment. Secondly, it increases the operating efficiency of the ICT technologies when they are installed and online. The other benefit is optimizing the performance of other energy using systems. The last one is substituting ICT related services for other goods and services within the economy.

ICT has a key role in terms of driving innovation productivity and growth in organizations and how people live, work and interact, so ICT sector continues to grow and is predicted to comprise 8.7% of global GDP by 2020 (The Climate Group, 2008, p.13). However, ICT creates some environmental problems. Computers and other IT infrastructure consume significant amount of electricity, placing a heavy burden on our electric grids and contributing the greenhouse gas emissions. Moreover; IT hardware poses severe environmental problems both during its production and its disposal. According to Murugesan (2008), IT is a significant and growing part of the environmental problems we face today (p. 24).

At the same time, due to the ICT, all economic sectors can become more energy efficient. By increasing the energy efficiency, it reduces the environmental impacts of other sectors because ICT allows existing processes to be optimized or enables entirely new, more energy efficient processes. Therefore; the energy that could be saved by ICT- induced energy efficiency is estimated to be several times larger than the overall energy consumption of ICT itself (GeSI, 2008, p. 10). According to the Climate Group, the European Commission recognizes this potential and hopes that Europe will achieve its target of 20% greenhouse gas reduction by 2020 to a relevant degree through the deployment of ICT (Coroama, Hilty, 2009, p. 1-2). Gartner states that "With the centrality of information technology and charges that the industry is responsible for 2% of the world's total CO2 emissions" (2007) Cited in Osch and Avital's article (Green IT to Sustainable Innovation, 2010, p.1). To reduce IT's environmental problems and to create sustainable environment, every computer greens its IT systems because green IT is a good way to eliminate bad results, and it is not surprising that the issues of Green IT/IS has gained momentum among academics and practitioners, so Green IT is the latest indicator of sustainable business practices. The decision about implementing or not to implement Green IT strategies, policies, and tools is a challenge for organizations. While practitioners have been highly interested in this topic for a while, recently, there is also growing interest on this topic among academicians (Brooks, Wangs, Sarker, 2010, p.1). Reducing energy cost (at a minimum) and environmental friendliness are the phenomenon of Green IT. In October 2007, a global "Green IT" survey was done by IT

professionals regarding to using professional services providers to assist in the planning and implementation of green IT policies and practices or not. The report (Mines, 2008, p.2) concludes that:

- The green IT services market will grow rapidly to nearly $5 billion in 2013. After 2013, the market will decline as most companies will have completed their initial round of green IT implementations.
- Assessments are the hook, tech implementations the big catch. The implementations phase of green IT services engagements will account for 65% of total market revenues in the coming years.
- Service providers with a corporate strategy perspective are the likely long-term winners. Today, most of the actions in Green IT are around the data center energy efficiency done by Dell, HP, and Intel. However, the long run winners in this market will bring a holistic approach to customers looking the incorporate IT into a corporate wide effort to improve environmental responsibility. This approach is pioneered by services providers like Accenture, Deloitte and EDS.

Nowadays, Green IT is a growing concept for academicians and practitioners, so this report focuses on some key areas that need examination in research surrounding Green IT. Firstly; we will look Green IT's definition because there seems to be a gap in an understanding of what is meant by Green IT. This is an important step before any rigorous academic research can be conducted on it. Then we will examine managerial attitudes towards Green IT which is related to effectively implementation of green It. Also we will look the practitioners' side to exactly see the real life examples of green IT and academicians' side. Finally, after we analyze all features and benefits of the Green IT, we will assess the future of the Green IT. The aim of this paper is to review the current literature on Green IT studies from both the academic and practitioner journals and publications.

2. BACKGROUND OF GREEN IT

2.1. Sustainability of Green IT

Sustainability of Communication Technologies is one of the main aims of today. Sustainability is associated with aspect of economic, environmental, and social impact of organizations (service suppliers, administration, academia, enterprises etc).Green IT is to be taking into account in the sustainability. These two concepts are linked to each other. Green usually means energy efficient and environmentally friendly and sustainable means "planning and investing in a technology infrastructure that serves the needs of today as well as the needs of today while conserving resources and saving money" (Pollack, 2008, p. 63). To reach effective results, sustainability is important but Green IT is the first step for all these purposes. As can be seen the Figure 1, a nested approach to sustainability, sustainable innovation is the broad and it contains Green IS/IT (Osch, and Avital, 2010, p.3). At this time, it is important to realize the difference between Green IT and Green IS. Watson et al. (2008, p.2) state that Green IT is mainly focused on energy efficiency
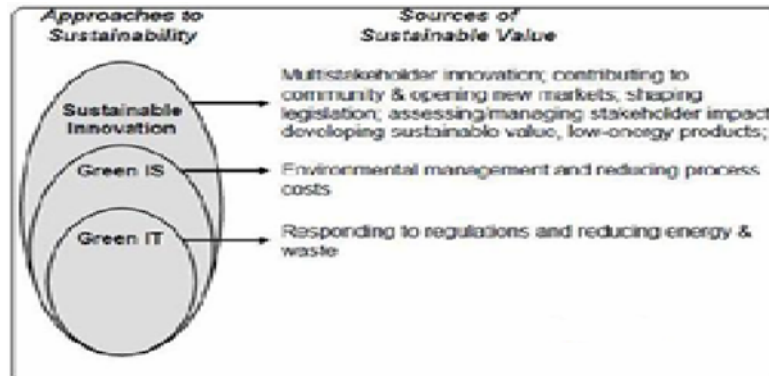
and equipment utilization, whereas Green IS, in contrast, refers to the design and implementation of information systems that contribute to sustainable business processes. Green IT addresses issues such as:

- Designing energy efficient chips and disk drives
- Replacing personal computers with energy efficient thin clients
- Use of virtualization software to run multiple operating systems on one server
- Reducing the energy consumption of data centers
- Using renewable energy sources to power data centers
- Reducing electronic waste from obsolete computing equipment
- Promoting telecommuting and remote computer administration to reduce transportation emissions.

After we looked the broader concept of Sustainability innovation, it is the time for the Green IT to analyze very exhaustively. Murugesan (2008, pp.25-26) suggest that Green IT is:

"*The study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems- such as monitors, printers, storage devices, and networking and communications systems- effectively with minimal or no impact on the environment. Green IT also strives to achieve economic viability and improved system performance and use, while abiding by our social and ethical responsibilities... Thus Green IT includes the dimensions of environmental sustainability, the economics of energy efficiency, and the total cost of ownership, which includes the cost of disposal and recycling... It is the study and practice of using computing resources efficiently*."

Figure 1. Sources of Sustainable Value (Osch, and Avital, 2010, p.8)

If we consider studying Green IT, we must think that Green IT includes power consumption and management, manufacturing practices, data center design and operations, recycling and end of life concerns for computer equipment, total cost of ownership issues, both micro and macroeconomic issues, system performance and

efficient systems use, and environmental, social and ethical practices relating to IT acquisition, use and disposal (Brooks, Wang, Sarker, 2010, p.2).

2.2 Reasons and benefits for using green IT practices

Adopting Green IT practices offers business and individuals financial and some benefits. As Osch and Avital (2010) discusses there are listed benefits of Green IT. Reducing power consumption and lowering cost have the highest percentages among the other benefits because most companies' first priorities in the environmental issues are energy efficiency and cost control imperatives. Because of the regulations, market based mechanism to address climate change rise, businesses will focus on environmental sustainability. For example; some buyers like Dell and Wal-Mart are asking their suppliers to take measures to "green up" their products and their manufacturing processes. They force their suppliers to behave environmentally sound practices. In the next five years, the inevitable result is that most of the companies will offer a range of new product and services, and new business opportunities will emerge.

Environmentally Sound Practices by Using IT

Green IT objective is to reduce energy consumption, thereby minimizing the greenhouse gas emissions by using computer systems and operating data centers. There are certain strategies (Murugesan, 2008, pp. 27-29):

- **Reducing energy consumption by PCs:** By making small changes to the ways we use computers, we can significantly decrease energy consumption. For example; most personal desktop computers run although they aren't being used. This leads to waste electricity also computers generate heat and require additional cooling, which adds to the total power consumption and cost for people.

- **Enabling power management features:** When we aren't using computers, we can program them to automatically power down to energy saving state without sacrificing performance. The US Environmental Protection Agency (EPA) estimated that providing computers with a sleep mode reduces their energy use by 60-70 %(As cited from Murugesan' s "Harnessing Green IT: Principles and Practices" articles,2008, p.28), thus the software places the PC into a lower-power consumption mode, such as shutdown, hibernation, or standby, and monitors into a sleep mode when they aren't being used. For the organizations, it is difficult to manage their enterprises' PC power consumption, so a pragmatic approach is to use software, we mentioned above, such as Surveyor from Verdiem (www.verdiem .com) that offers network-level control over PCs and monitors.
- **Turning off systems when not in use:** This strategy is the most basic energy conservation for most systems.

- **Using screensavers:** Screensaver that displays moving images, which continually interacts with the CPU, conserves less power than a blank screensaver but it reduces energy consumption by only a small percentage.
- **Using thin- client computers:** Thin client computers draw about a fifth of the power of desktop PC but it is used only with active participation and wholehearted willingness from users. This is achieved with employee education by changing their computer habits, so enterprises must take into account of their employees' feedback and address their concerns, and encourage them to join in green computing efforts.
- **Greening Data Centers:** The rise of internet and web applications leads to rapid growth of data centers. Enterprises are installing more servers and expanding their capacity and each server draws far more electricity than earlier models. Also operational costs for data centers are increasing because energy pricing is increasing. Besides the cost, availability of electrical power is becoming a crucial issue for many companies whose data center have expanded steadily, so these constraints force the companies and IT departments to reduce energy consumption by data centers. They are taking some actions to increase data center efficiency by using new energy efficient equipment, improving airflow management to reduce cooling requirements, investing in energy management software, and adopting environmentally friendly designs for data centers and new measures to curb data centers' energy consumption. The coming three topics are related to green data centers: energy conservation, eco-friendly design, and server virtualization.
- **Energy conservation:** As we mentioned above, data center operating expense is high and most of the costs are related to cooling, so IT industry is inventing new ways to help address this issue. For example, companies like IBM, HP, SprayCool, and Cooling are working on technologies such as liquid cooling, nono fluid-cooling systems, and in-server, inrack, and in-row cooling. Other ways to make data centers more environmentally friendly are new high density servers, hydrogen fuel cells as alternative green power sources also by applying virtualization technologies; the total power consumption of servers and the heat generated reduces.
- **Eco-friendly design**: Organic compound (VOC), countertops made of recycled products, and energy efficient mechanical and electrical systems at optimal efficiency. Eco designs make use of natural light as well as green power which means that electricity generated from solar or wind energy to run the data center, so adopting eco-friendly designs provides many benefits to the enterprises such as complete design control, reducing heat and adding light. For instance; many American enterprises are adopting the Leadership in Energy and Environmental Design (LEED) standards maintained by the US Green Building Council (www.usgbc.org) for building new data centers. LEED focuses on some key

areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

- **Virtualization**: It is a key strategy to reduce data center power consumption. It enables data centers to consolidate their physical server infrastructure by hosting multiple virtual servers on a smaller number of more powerful servers. These lead to less electricity and simplifying the data center. Also it reduces the data center floor space, the data center's energy demands and makes better use of computing power.

2.3. Management perspectives towards the green IT

Nowadays, Green IT is the most effective investment among the companies. Enterprises are increasingly going green and looking more deeply IT operations to reduce corporate energy consumption and become more environmentally responsible because Corporate IT organizations are feeling increasing pressure, and finding growing opportunities to improve their sustainability practices and they are responding by building capabilities, forming alliances, and positioning their resources to capture mindshare and wallet share of user companies putting green IT initiatives in place. The new market is created for companies namely Green IT services. This market is defined as:

> "*Consulting services that help enterprise IT organizations reduce their companies' environmental impact by assessing, planning, and implementing initiatives that make the procurement, operation and disposal of IT assets more environmentally responsible*"(Mines, 2008, p.2)

For example; strategists at a broad set of IT services providers, from data center specialists like HP and Intel to corporate strategy consultants like Accenture and Deloitte are positioning to participate in nascent market (Mines, 2008, p.1). Also companies feel the pressure from government regulators and legitimate environmental watchdogs to align their business with environmental sustainability practices. For example; Kyoto protocol agreement means that organizations are now motivated more than ever to monitor their carbon emissions because Green IT practices will be inevitable in the future. Therefore; managing IT infrastructure concerning Green IT requires a strong commitment from the echelons of corporate leadership, namely senior IT management (Sarkar and Young, 2009, p.2).

If we want to green our IT, we must consider and analyze internal and external constraints like cost, customer requirements, and government regulations. After determination of applying Green IT, enterprises should develop a green IT policy, outlining aims, objectives, and goals, plans of actions, and schedules to effectively implement Green IT strategies to their organizations. To green their IT, enterprises can take any one or a combination of the following three approaches (Murugesan, 2008, p.31):

- **Tactical incremental approach:** With this approach, enterprise protects the existing IT infrastructure and policies and incorporates simple measures to

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accomplish their moderate green goals such as reducing energy consumption. These measures are easily implemented with a minimum cost but these are only short term ad hoc solutions.

- **Strategic Approach:** In this approach, enterprises develop a comprehensive plan addressing broader aspects of greening its IT and implements distinctive new initiatives. For instance; an enterprise can implement new energy efficient, environmentally friendly computing systems, or it may develop new policies on procurement, operation, and/or disposal of computing resources. Although this approach considers cost efficiency and reduced carbon footprint, it also thinks the other factors such as branding, image creation, and marketing.

- **Deep green approach:** This approach improves the highlighted strategic approach. For example; an enterprise adopts additional measures such as implementing a carbon offset policy to neutralize greenhouse gas emissions. With this approach, we can look deeply by including planting trees, buying carbon credits from one of many carbon exchanges, or using green power generated from solar or wind energy.

3. LITERATURE REVIEW

3.1 Academic literature

Although Green IT is becoming more common in discussion, there is little academic research about this topic. The existing literature related to environmental sustainability is dominated by industry practitioners, industry consortiums, industry research groups, environmental groups, governmental bodies and international organizations. However; academics have only recently begun to take into account Green IT. From the review of the literature, there are three main factors. These are motivational factors, organizational factors, and technological constraints (Kuo, 2010, p.4)

- **Motivational Factors**: There are three motivations to induce corporate environmental responsiveness: competitiveness, legitimation and social responsibility. Competitiveness is related to Organizations' profitability such as reducing cost and generating more revenues. In order to avoid penalties and lessen risk, organizations comply with norms and regulations, thus organizations protect themselves and survive. Social responsibility motivations are related to 'feel-good' factors and are solely internal within the organization.

- **Organizational Factors:** These factors are related to internal environment of organizations such as human resources and capabilities. If these factors aren't 't available in the appropriate quantity and at the necessary quality, Company may unable to act, so when senior management is strongly supportive of environmentally sustainable initiatives, the extent of green IT in organizations should be significantly higher.

- **Technological Constraints:** Technological constraints may play a more significant role in limiting an organization's ability to begin certain Green IT

initiatives because some actions related to green IT depend on some qualified and innovative technology, so if companies don't have enough technology, undertaking green IT initiatives may become difficult.

Green IT is a new field, so there is less academic research. Table 1 (Brooks; Wang and Sarker 2010) shows some academic literature about green IT.

Journal/Conference	Reference	Topic/Research Question	Category	Conclusion
ACIS 2009	Molla et al (2008)	A Green IT Readiness Framework	Adoption choice;	Attitude, policy, practice, technology and governance are the five drivers that enable enterprises to deploy environmentally sustainable IT and IT processes
PACIS 2009	Sarkar and Young (2009)	Managerial attitude of Green IT	Adoption choice	Attitudes will be transformed into action when a sound model exists, supplemented with articulately designed long-term awareness programs
PACIS 2009	Vykoukal et al (2009)	Relationship between Green IT and Grid Technology	Adoption choice; Eco-Efficiency	Green IT (Grid technology) has economical and ecological benefits. It also increases the companies' competitiveness
PACIS 2009	Molla (2009)	Organizational motivation for Green IT	Adoption Choice; Eco-Efficiency , and Eco-Collaboration	A Green IT-Reach-Richness Matrix to classify Green IT strategies and initiatives
AMCIS 2009	Mann et al (2009)	The implementation framework of Green IT	Post Adoption	Three step implementation framework for Green IT
AMCIS 2009	Sayeed and Gill (2009)	Explore the implementation of Green IT measures	Post Adoption; Eco-Efficiency and Eco-Collaboration	By mobilizing their dynamic resources, the organizations are able to leverage Green IT implementation for strategic purposes
MISQ Executive	Weiss (2009)	UPS experience with Green IT	Post Adoption; Eco-Collaboration	Collaboration between IT and other business units at UPS to implement "green" and sustainable practices

Table 1: Academic Literature (Brooks; Wang and Sarker 2010, p.6)

3.2 Practitioner Literature
In this part we look the Green IT practices from practitioners' points of view and we give the specific examples which are done by companies regarding to green IT and literature review of practitioners' side. The published literature from practitioners' side of information technologies falls into four complementary categories: Green use, Green disposal, Green design, and Green manufacturing. (Murugesan, 2008, p.27). These are the holistic approach to the problems. Their meanings are:

- *Green Use:* Using computers and other Information systems in an environmentally sound manner in terms of reducing energy consumption.

Green metrics, assessment tools, and a methodology (ISO 14001) for effective use and practice.

- *Green disposal:* Refurbishing and reusing old computers and properly recycle unwanted computers and other electronic equipment. Disposal and recycling practices are responsible, sustainable, and comply with applicable regulatory requirements along with the pollution prevention (Murugesan, 2008)
- *Green design:* Energy efficient and environmentally sound component, computers, servers, and cooling equipment designs. Design and strategies for environmental sustainability including data center design and allocation (Cameron, 2009; Going Green with IT, 2008)
- *Green Manufacturing:* Manufacturing electronic components, computers, and other associated subsystems with minimal or no impact on the environment. Energy efficient computing including power management and virtualization (Cloud computing and SaaS) (Big Blue Goes Green, 2007)

In addition; they are linked to the three sided diagram from Siggins and Murphy (2009). These are three orientations to adopt Green IT: eco-efficiency, eco collaboration, and eco innovation (Brooks, Wang, Sarker, 2010, p.5). Green use and Green Disposal relate to Eco-Efficiency, Green Design relates to Eco collaboration, and green manufacturing relates to Eco Innovation.

Green Software

Greening software is also important for the practitioners in terms of speed, energy monitoring, speed with new inventions, and grouping of new software (Abenius, 2009, pp.60-61)

- **Speed:** Computers' lifecycle is significant for every user which means that usage. As users, we are more sensitive about speed especially while we are browsing Internet. On the market, there are predeveloped tools for cutting electricity costs or speeding up a web site or both such as the Runtime Page Optimizer (RPO).
- **Energy Monitoring:** By using any of the existing energy monitoring tools to manage power, something classified as Green software can be achieved. These tools allow visualization of the power consumption and possibilities to choose the level of energy savings and calculation of estimated savings among other features like IBM Active Energy Manager and Edison by Verdiem.
- **Speed with New inventions:** Swedish company Oricane founded in 2006 by Ph.D. Mikael Sundström is the best example for the greening or sustainable software. Oricane develop what they claim to be green software technology for many Internet applications to reduce the total power consumption of the Internet and minimize the environmental impact of Internet's explosive growth. They are doing this by optimizing all decision processes in software with new potential algorithms. Ultimately, the power consumption of the hardware on which the Internet is built will be reduced.

- **Grouping of green software:** So far, we looked three different types of green software. Following Table 2 shows that the last one is the grouping these actions and tools.

Green Software			
Grouping	**Existing tools**	**Existing tools**	**New inventions**
Actions	Monitor and Measure	Speed	Speed
Actions exemplified	Monitor and measure in order to optimize energy consumption.	Increase internet speed and decrease traffic load, manipulating software.	Increase internet speed and decrease traffic load, with efficient algorithms.

Table 2 Green Software (Cited in Abenius, 2009, p.60-61)

3.3 Examples of Green IT Services From Different Angles through the Vendors

The approaches of the vendors from different angles towards the green IT can be categorized as (Mines, 2008, p.8):

- *Services arms of IT systems manufacturers(Dell, HP, Intel, and Sun):*
  These companies' service practices are pretty tightly tied to their product offerings; thus, tend to be focused on data center design and optimization.
- *IT systems integrators/outsources(CSC, EDS, Getronics, and Wipro)*
  Getronics and Wipro are data center oriented, CSC and EDS have broader visions of corporate green initiatives and their IT's role within them.
- *IT consulting giants(Accenture, Deloitte, and IBM)*
  These companies objective is to help clients position IT as an enabler and contributer to wide ranging green business initiatives. They approach IT from the corporate sustainability and CSR perspectives
- *Telecom services supplier (BT)*
  They focus on helping clients address their green IT challenges and opportunities

With respect to Green IT/IS, mentioned in previous pages, HP is the best example. The company is the forerunner in the IT industry. It was the first company to set recycling programs from 1994 onwards and it was one of the key drivers of several industry initiatives for green IT/IS and sustainable innovation. The greening and sustainability efforts of HP in each of the above mentioned phases are summarized in Table 3.

Strategies	Green IT 1990 -	Green IS 2000 -	Sustainable Innovation 2003 -
Examples from HP:	• Europe-wide recycling scheme in response to German recycling laws • Free recycling programs in response to California state legislation and the EU WEEE directive • Elimination of hazardous substances in response to EU RoHS directive • Production of energy efficient products in order to earn the EPA Energy Star label	• ISO40001 Certification of Environmental Management System	• Collaboration with key stakeholders and strong commitment to community through organizing recycling events for informing consumers; stimulating university research and education on social responsibility; setting up digital inclusion projects • Radical rethink and redesign of electronic products and manufacturing processes • Shaping legislation and initiating industry initiatives • Assessing and managing stakeholder impacts along the supply chain • Multi-stakeholder product innovation

Table 3. The Sustainability Journal of HP (Osch and Avital, 2010, p.7)

Case Study (Computer Sciences Corporation- CSC)

Australian developed initiative, GreenWay, is adopted throughout CSC in 2008 for all environmentally sustainable innovations (Shown on Figure 5). CSC is a

> *"Leading global consulting systems integration and outsourcing company... With the mission to provide   customers in industry and government with solutions crafted to meet their strategic goals and enable them to profit from the advanced use of technology."(CSC 2008a)*

GreenWay represents improvements such as virtualization to existing IT technology but extends to improving all environmental aspects of operations from: solutions provided to clients; operations in data centers; and efficiency improvements in facilities. The major goal for the GreenWay in 2008 is to reduce carbon emissions by 25% by 2010(from 2007 levels) (Elliot and Binney, 2008, p.6). In addition; a review of practitioner publications are summarized in Table 1.This table indicates that Green IT is usually associated with technologies for improving the energy of data centers (ACS, 2007; Mitchell, 2008; Pettey, 2006) for reducing the environment impact of IT operations (Nunn, 2007); and the use of IT as an enabler of organizational wide green initiatives (Gartner, 2008; Mines and Davis, 2008). It encompasses not only hard technological solutions but also soft business practices and managerial actions to make IT decision making as eco friendly as possible (Info~ Tech 2007a).

4. FUTURE OUTLOOK AND CONCLUSION

Investment in environmentally sustainable IT is the key to future success. A growing number of IT vendors and users are moving towards the green IT and thus assisting in building a green society and economy. When organizations are faced with more green taxes and regulation, they will favor green IT solutions. When we look at the government's actions through the green IT, they can create new legislation to encourage

ICT vendors and users to be more energy efficient in the future. Corporate Leaders Group on climate change states that "We need strong policy framework that creates a long term value for carbon emission reductions and consistently supports the development of new technologies" (Global Action Plan, 2007, p.6) This means that in the future Greening activities will increase. From the vendors' points of view, they must improve their transparency, accuracy and quality of the environmental information and technologies because these actions will differentiate organizations from each other. Green IT will significantly help organizations to reduce their environmental impact.

After reviewing Green IT perspectives of both practitioners and academicians, there appears many overlap between them. When existing academic literatures and practitioner literatures come together, greening IT can be most meaningful and powerful. Environmental sustainability is growing as an importance concept among both practitioners and academicians. Business executives expect environmental themes to become preeminent issues and they have already begun to follow green IT strategies. However; although there are many studies available in the practitioners' side, it is still not known its meaning exactly, so this paper provides good understanding about green IT. Green usually means energy efficient and environmentally, so greening IT leads to reducing power consumption, lowering carbon emissions and environmental impact, and lowering costs for the organizations and individuals. Ultimate goal of the green IT is sustainability and eliminating environmental bad results. However; applying Green IT is not easy because everything related to organizations' internal and external environment must consistent with Green IT applications because if businesses don't prepare needed floor such as motivation in terms of competitiveness, legitimation, and social responsibility or technological and organizational capabilities, they can't be success. Its impact on the businesses is very high in terms of the profitability and environmentally. Therefore; Green IT is the best practices among the organizations and best research field for the academicians.

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