GREEN IT READINESS – A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE IT

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Abstract

Purpose - The purpose of writing this paper is twofold. Firstly, the goal is to establish a sound understanding on the role of Green IT in leveraging IT by analysing '*Green IT elements*'. Second is to determine the '*Green IT Readiness –levels'*, which mean companies' understanding in integrating environmental viewpoint to IT related activities throughout its IT operations.

Design/methodology/approach – A thorough literature review and exploratory research on Green IT is the first step of the research, to examine various Green IT elements - *attitude, policy, practice, technology* and *governance* – which together create the critical quality we call "G-Readiness". The gathering of information from relevant sources is been done in order to construct a theoretic background in the topic.

Findings – On the basis of secondary research analysis conceptual model or framework is built based on the sources and the connections among them.

Research limitations/implications – Since the paper is solely based on the secondary research, the practical implication lacks a bit. The conceptual framework is part of a research project which aims to contribute to the field of IT.

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Practical implications – IT sectors' worldwide are increasingly becoming aware of the strategic role that IT can play in both greening the IT infrastructure and supporting a business's overall green initiative. What we don't know is how ready IT is to acquit these roles. Attainment of better understanding of Green IT and its impact on IT is a research priority, which will give an idea how Green IT Ready are we.

Originality/value – The inclination headed for green information technology (IT) over the decades is a result of an acknowledgement of both the environmental issues related to IT and the crucial role IT plays as a potential cause of solutions to environmental concerns. Hence, it is mandate to enhance our knowledge with the role of Green IT and an in-depth study of various Green IT conceptual frameworks.

Keywords – *Green IT, Information Technology, Green IT Readiness, Green IT Elements, Green IT conceptual framework.*

Paper Type – Research Paper

1. Introduction

IT contributes unswervingly to only some 2% of the world's carbon emissions which is one of the functions of every IT organisation operations. A 2008 report by The Climate Group on behalf of the Global e-Sustainability Initiative (GeSI) gives us a vague idea that IT can condense total global emissions by 15% by the year 2020[(1)]. Also 'Green IT' which comes into picture when we talk about environment friendly IT, is not an individual agenda; it's a synonym for 'effective IT'. It's a tool for achieving business and environmental objectives simultaneously. The same IT tools you use to make your organisation more competitive and efficient can also help you become environmentally sustainable.

IT operations inherently have a negative effect on the environment. IT equipment consumes large amounts of electricity, which contributes to greenhouse gas emissions. Furthermore, the production and disposal of IT hardware can lead to harmful pollution and toxic materials being released into the environment [(2)].

One of the ways in which organisations can reduce their carbon footprint and lessen their harmful environmental impact is through adopting environmentally friendly Information Technology (IT) practices. Such practices are frequently referred to as "green IT".

This paper aims to take a generic perspective to discuss the concept of Green IT and put front the main driver and elements that contribute to a G-readiness framework for evaluating the readiness of individual organisation adopting the Green IT concept. The worth of such a framework and the role of this paper in the field of sustainable IT is countless and adds to cognizance. First, the paper puts a light over decisive area that is an attempt to define a Green IT and its' vital elements and driving forces that help in adoption of Green IT to the present practices and various IT operations. Secondly, the paper tries to correlate the drivers, elements and frame a conceptual readiness (G-readiness) framework; which can be further utilized as a medium to understand and assess the Green IT initiatives and practices to measure sustainable progress in various organizations around the world.

2. Methodology

Exploratory research on Green IT is the first step of this work, as it was presented above, the gathering of information from relevant sources has been done in order to construct a theoretical background on the topic. After, the construction of literature background, the conceptual model or framework is framed relying on the sources and the connections among them, as mentioned in the later stage of the paper, these include *Green IT Drivers and Green IT Elements*. The presented model in the research is the first upshot of this research paper, which is as presented above.

Methodology revolves around two phases: Exploratory and proposition of conceptual framework for G-readiness.

In first exploratory research phase the paper tries to collect as much as information about Green IT and it's requirement in IT organizations, when we talk about its' IT equipments and services. Further, while exploring two important pillars of the Green IT were determined, that includes the 'Drivers' and 'Elements'. Now, when we take the pillars into consideration the other factors are also revealed. These factors are aggregated to determine the pull and push factors in the organization.

Next, in second phase the detailed factors – 'Drivers' and 'Elements' and their sub factors helped in this research paper to draw an outline for a 'G-readiness' Framework. These factors and its sub factors accelerate IT operations and maintain their Green Quotient throughout its' operations. Further, in this paper the explored points have helped to measure so as to what level are the organizations ready to adopt, accept and implement Green IT to their functionality.

Throughout the secondary research, loads of related research papers and frameworks are reviewed. These have been a contractual base for the proposed framework explained in the research paper in the later stage.

3. Literature Review

3.1 Green IT defined: *"A systematic application of ecological-sustainability criteria (such as pollution prevention, product stewardship, use of clean technologies) to the design, production, sourcing, use and disposal of the IT technical infrastructure, as well as within the human and managerial components of the IT infrastructure, in order to reduce IT, business process and supply-chain related emissions, waste and water use; improved energy efficiency and generate Green economic rent."*[(3)]

3.2 Drivers of Green IT

On the basis of the literature review, this paper describes four drivers of Green IT as: *economical, regulatory, ethical and motivational*. While these drivers are not necessarily similar on each other, the dominance of a driver can persuade the substance and process of Green IT initiatives and can favour Green IT practices and policies.

3.2.1 Economical - refers to the need for greater IT efficiency and the pursuit of tangible cost savings from IT operations. The extension of global business and the thirst of keeping copies of the same data to conform to convention and to fulfil business stability are primary to sudden rise in stored data. The volume of organizational data has crossed one million terabytes in 2007 and is likely to reach a zeta byte by 2010 (IDC in Brocade, 2007). More data means need of larger servers and more requirements for power. In data centre life, the cost of powering and cooling is approximate to surpass both the cost of the IT and the electrical, electronic equipment [(4)]. Efficient drivers can

lead to Green IT initiatives that yield substantial, cost savings. Few of these comprise of electrical power usage and power bill analysis, server virtualisation, retiring energy, PC power saving, and redesign of data centre architecture .[5]

3.2.2 Regulatory - refers to the pursuit of legitimacy. The stress here is on actions that are induced because of the need to meet certain regulatory (both mandatory and voluntary) demands. A number of governmental, private organizations are rigorously following guidelines related to green ICT. Waste Electrical and Electronic Equipment (WEEE), Setting national emission targets, targets and join carbon trading schemes [6] are at the moment, the regulations accepted voluntarily.

3.2.3 Ethical - refers to the pursuit of socially responsible business practices and good corporate citizenship. Green IT is now considered as one of the CSR activity with immense potential to unleash new source of competitive differential [7]. Ethical drivers of Green IT can lead to Green IT preferences associated with business, which are socially and willingly accepting norms of going green such as reducing emission, recycling, and reuse [8].

3.2.4 Motivational - refers to economic opportunities for the various IT organizations. It includes ethics and values to be applied to the organizations working to satisfy their stakeholder's needs, keeping in mind the sense of responsibility. In today's scenario Green IT is taken as a competitive effort and followed as legislation rules.[9]

Economical	Regulatory	Ethical	Motivational
Pursuit of Tangible Cost Savings	Pursuit of legitimacy	Pursuit of socially responsible business practices	Economic Opportunities
Greater IT efficiency	IT carbon foot print analysis	Good Corporate Citizenship	Ethics and values
Data De-duplication	IT procurement practices	Social Recognition	Satisfying Stakeholders
Server virtualisation	IT end of life management	CSR initiatives to capture the mind	Sense of Responsibility
Retiring Energy	Set National Emission Targets	Environmental Awareness	Competitiveness
Redesign of data centre architecture	Join carbon trading schemes	Competitive Differential	Legislation

Reducing Emission	Electronic Waste Management	Recycling And Reuse	Philanthropy

Figure.1. Drivers of Green IT

Economic, ethical, regulatory and motivational drivers can determine the basic motives for Green IT adoption. However, the force (internal or external or both) depends on a business's technological, organisational, environmental and on its motivation for Green IT. These elements presented here are as fundamental components for sustaining Green IT strategies and practices, in overall IT operations.

3.3 Elements of Green IT

Further on the basis of exploratory research it is found that there are five important points that can accelerate success rate in greening IT – *attitude, policy, practice, technology* and *Green IT governance* – which together form "*G-Readiness Elements*" [(10)]. Thus G-readiness framework represents a unique combination of five drivers that enable enterprises to position environmentally sustainable IT and IT processes that are focused, accountable and measurable. And concentrate on its elements that can on the other hand be used as a measure of IT preparedness to support its initiatives in the low carbon footprints.

3.3.1 Attitude - Attitude refers to the affective characteristics of IT that include awareness and interest about the economical, strategic, regulatory, environmental and social concerns related to the use of IT. IT's attitude for reducing IT Power Consumption and joining green movement.

3.3.2 Policy - Policy readiness measures the extent to which green and sustainability policies are developed throughout an organisation and infuse the value chain. Most IT companies do not have any policy supporting the philosophy of Green IT (Pearlman n.d.). Three value chain considered to assess the policy readiness are –

- ✓ *IT sourcing policy* - - refers the extent to which an organisation has adopted an environmental purchasing policy (EPP) and expressed unambiguous green policies for using and buying IT equipment and services. EPP is a policy alternative that promotes purchasing decisions keeping in mind the environmental impacts.

  The extent of green guidelines has so far covered both upcoming and old age IT equipment innovations. It has covered the possession and use of IT office equipment – desktop, monitors, photocopiers, printers, fax machine, scanners, and multifunction devices.
- ✓ *IT operations and services policy* - encompasses the level to which the services provided by the IT support issues incorporated in business sustainability. Some of the policy considerations include PC power management and environmental policy.
- ✓ *IT end of life policy* - refers to the policies and regulations related to the clearance and resolution of IT equipment in organisations. This end of life policy reflects an organisation's commitment to technology redundancy and to the roll-over of technologies in order to attain full benefits of each technological advance.

3.3.3 Practice - The practice dimension of g-readiness captures the cerebral dimension of g-readiness. Practice readiness measures to what extent an organisation has accumulated its concerns and policies into actions. Three value practice assessed are –

- ✓ *Green IT sourcing practice* - captures the extent to which environmental considerations are encapsulated in IT operations. Green sourcing practices also include taking a strong hold on the use of green technologies during processes and operations in IT equipment to gain access to energy efficient equipment. The association of suppliers is a critical element of Green IT sourcing practice.
- ✓ *Green IT operations and services practices* - *Green* IT operation practices can range from clients through servers and people to network infrastructure. Also, other operational actions to reduce power consumption include retiring systems, operating existing systems in an efficient manner; and migrating to more energy efficient platforms.
- ✓ *Green IT end of life management practices* - this refers to the conformity of IT equipment manufacturers, users, and resellers in Green IT end of life management. In terms of IT manufactures, issues regarding Green IT end of life management would be such as packaging of IT equipments, reusability and recycling the IT equipment/materials to not harm the environment.

3.3.4 Technology - Green IT is all about acquiring more environmentally effective (greener) technologies. An important driver of g-readiness success in the area of IT is technology. It was highlighted that businesses and countries spend billions of dollars each year to power computers [(11)]. This creates a bad image for IT as being energy-consuming and bad for the environment. Some of the commonly adopted green technologies include server virtualisation, IT recycling, data centre energy optimisation and rightsizing IT equipment.

3.3.5 Green IT Governance - Governance refers to the management infrastructure to apply Green IT. Governance is about roles, responsibilities, accountability and control to be clearly established for sustainability with Green IT.

Attitude	Policy	Practice	Technology	Green IT Governance
Awareness & Interest	Supporting Sustainability Policies	Implementation of Policies	Server Consolidation	Roles, Responsibilities, Accountability And Control
Environmental Concern	IT sourcing Policy	Green IT sourcing practice	Server Virtualization	Administration of Green IT Initiatives
IT Planning Concern	IT operations/Services Policy	Green IT operations and services practices	Rightsizing IT Equipments	Assessment of Green IT Impacts
Reducing IT's Power Consumption	IT End-of-Life Policy	Green IT end of life management practices	Data Centre Energy Optimisation	Measuring IT Power Consumption Efficiency
Joining Green Movement	Green IT Policy	Readiness Measure	IT Recycling	Standard Green IT Administrative Process

Figure.2. G-Readiness Elements

3.4 Conceptualising Green IT Readiness framework

In defining the G-readiness framework in the research, literature review over the concept of Green IT and sustainability were done. This further draws the idea behind the need of Green IT in today's scenario and how its' adoption can benefit the biosphere. Also Green IT *Drivers* and *Elements* are incorporated for building conceptual *Green IT Readiness Framework.* [(12)]

The framework referred can relate to implementing green practice in general. However in this paper, g-readiness is conceptualised as a measure of IT readiness to be environmentally responsible and differentially competitive.

The ethical and environmental elements can relate as a sense of nature, moral sense and environmental sense. Also, motivational and regulatory elements can relate to sense of social responsibility. These are however required to maintain a perfect balance between environment and sustainability with IT. However, these drives can prove to imply on as competition for efficiency between humans and technological advancements. Green IT can so far be taken as best adaptation to the imitation of life. In all sense, GIT can be expressed as a means of implementing the prospect of stretching the maximum polite of each one for future prosperity.

	Ethical	Economical	Regulatory	Motivational
Action	Pursuit of socially responsible business practices	Pursuit of Tangible Cost Savings	Pursuit of legitimacy	Economic Opportunities Ethics and values
Policy	Good Corporate Citizenship Social Recognition	Greater IT efficiency Data De-duplication	Set National Emission Targets	Sense of Responsibility
Practices	CSR initiatives to capture the mind	Server virtualisation	IT carbon foot print analysis, IT procurement practices	Philanthropy
Technology	Competitive Differential Recycling and Reuse	Redesign of data centre architecture, Reducing Emission	IT end of life management	Satisfying Stakeholders, Competitiveness
Green IT Governance	Environmental Awareness	Retiring Energy	Join carbon trading schemes	Legislation

Figure.3. Green IT Readiness Framework

This framework represented above is an integral attempt to understand Green IT, and its attributes. However, as green issues continue to charm global quest, IT is likely to play a vital role in both greening its operations and services to support and fulfil the motive of business's overall

environmental sustainability objectives. This is possible only when IT acquires Green IT solutions. In this paper, we identified five concerns of Green IT – economical, environmental, technological, and motivational. Also other elements have also identified for greening IT – *attitude*, *policy*, *practice and governance*. These when incorporated can promote business to attain success in all of the dimensions to demonstrate g-readiness.

4. Conclusion

The conceptual framework presented in this paper is part of a partial research. Hence, it would an injustice and too early to draw any conclusions. Nonetheless, the proposed framework gives a feasible base to steer the research about Green IT and its relationship with the organizations and other stakeholders. Understanding how the elements presented in the framework are interrelated and how they affect organizations and, largely the society, will help us to craft new frameworks and models, on sustainable ways. Also, this would prove to be an initial platform for near upcoming practices and researches. The main motive to address this model is to contribute to a holistic acuity of the drivers and elements which affect and are affected by Green IT. Therefore, making a Green IT roadmap towards a sustainable development in which IT plays a crucial role.

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