EMPIRICAL TESTING OF GREEN INFORMATION TECHNOLOGY MODEL IN UAE

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ABSTRACT

Green Information Technology (GIT) is gaining utmost importance as organizations come under pressure to address environmental and economic sustainability. Although, It is a matter of great concern for business, government, researchers and academicians yet measures to determine the capability of organizations to Green their IT remains is still elusive. The ultimate intention of using or adopting GIT is to provide organizations a setup so that they can perform all their processes with zero or negligible effect on the nature's domain. The researcher contend in this research is that there is an sincere requirement to consider the components that propel them to receive green IT as one viable reaction to the risk of a dangerous atmospheric deviation or global warming and other environmental change. A model called as Green IT Adoption Model (GITAM) was proposed by Molla. Researcher has tested the above model in context of UAE to identify the components that motivates the organization to adopt Green IT. The results of this study will help the organization to make sustainable strategies to implement GIT for their economic and environmental sustainability. In this regard, this study fills the gap between the principles of green information technology and sustainability of organizations

Key words: Green Information Technology, Green Computing, Sustainable development, Green IT Adoption Model, Green IT Adoption

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1. INTRODUCTION
In recent decades, sustainable development has emerged to become a hot issue for governments, societies, as well as businesses that ranging from underdeveloped, developing to developed countries. At the same time, Information Technology (IT) offers many benefits including increased productivity, access to information, and convenience. However, the production, use, and disposal of computers require large amounts of energy and resources. Information technology offers many opportunities for organizations to operate in a greener manner and provides an opportunity for sustainable development. Corporate awareness of “Green IT” has evolved to the point where there is now general acceptance that green IT and green IS can be used to improve organizational performance – as an example the Gartner group has identified it as one of the top strategic technologies for a number of years [1,2]. The phenomenon of green IT has moved from being a concern of purely environmentalists and scientists to a legitimate business strategy [3, 4, 5].

Green IT enhances the sustainability of computing through manufacturing lower impact materials and products, reduced energy consumption of data centers and computers, and better recycling and end of life management. To respond effectively and efficiently to the environmental sustainability challenge, appropriate strategies and operations are needed [6]. Therefore, IT is also expected to play a lead role in supporting a business’s sustainability initiatives. Green IT has a potential to create new competitive opportunities, to reduce carbon emissions, and to improve overall business efficiency [7, 8]. As a result, the adoption of Green IT can be considered as a critical factor not only for the sustainability of businesses but also the success of the low carbon economy. While the opportunities and potentials of Green IT might be attractive, the extent of Green IT adoption and the actual realization of the benefits that Green IT aficionados allude to remain unknown. A model called as Green IT Adoption Model (GITAM) was proposed by Molla. The model defines Green IT from four distinct but interrelated perspectives. It posits that the technological, organizational and environmental contextual variables, dynamic Green IT readiness dimensions and strong order Green IT drivers can predict the intention and the breadth and depth of Green IT adoption. The purpose of this paper is therefore to use the GITAM model in context of UAE to identify the factors that motivates the organization to adopt Green IT.

The current study aims to address the question, “what motivates organization to adopt green and sustainable IT solutions?” The results of this study will assist in providing insights into the reason behind the adoption of green IT and the results are significant for the stake holders and other academicians also.

2. LITERATURE REVIEW
As IT plays an integral role in almost all facets of businesses, and as each stage of the IT lifecycle from manufacturing to usage and disposal can pose environmental damages [9], it naturally follows that demands “environmental sustainability” should be extended to IT too. Enterprises, governments, and societies at large have a new important agenda: tackling environmental issues and adopting environmentally sound practices. Over the years, the use of IT has exploded in several areas, improving our lives and work and offering convenience along with several other benefits. However, IT has been contributing to environmental problems, which most people don’t realize. Computers and other IT infrastructure consume significant amounts of electricity, placing a heavy burden on our electric grids and contributing to greenhouse gas
emissions. Additionally, IT hardware poses severe environmental problems both during its production and its disposal. It is a significant and growing part of the environmental problems we face today. We are obliged to minimize or eliminate where possible the environmental impact of IT to help create a more sustainable environment.

IT affects our environment in several different ways. Each stage of a computer’s life, from its production, throughout its use, and into its disposal, presents environmental problems. Manufacturing computers and their various electronic and non-electronic components consumes electricity, raw materials, chemicals, and water, and generates hazardous waste. All these directly or indirectly increase carbon dioxide emissions and impact the environment. The total electrical energy consumption by servers, computers, monitors, data communications equipment, and cooling systems for data centers is steadily increasing. This increase in consumption of energy results in the increase of greenhouse gas emissions. Each PC in use generates about a ton of carbon dioxide every year.

Green IT refers to environmentally sound IT. It’s 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—efficiently and 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. Green IT spans a number of focus areas and activities, including design for environmental sustainability, energy-efficient computing, power management, data center: design, layout, and location, server virtualization, responsible disposal and recycling, regulatory compliance, green metrics, assessment tools, and methodology, environment-related risk mitigation, use of renewable energy sources; and eco-labeling of IT products.

According to S Murugesan’s [10] definition, there are three main areas to be focused, when studying, practicing, designing, manufacturing and using IT equipment. They are efficiency, effectiveness and minimal impact to the environment. S Murugesan’s [10] definition is focused on the tangible IT hardware. This definition lapses in organizational perspective and contribution of IT for greening the other disciplines. According to A. Molla et al. [11] Green IT is an ability of an organization to deploy environment sustainable criteria for IT infrastructure life cycle. O’Neil [12] defined Green IT as a reduction of carbon footprint within an organization by deploying initiatives which are desirable and strategic. According to S Mingay [13], Green IT is optimal usage of IT for environment sustainability within an organizations operations and supply chain, and over and above to that of products, services and resources, throughout the duration of their life cycle. While the opportunities and potentials of Green IT might be attractive, the extent of Green IT adoption and the actual realization of the benefits that Green IT aficionados allude to be studied.

The literature indicates that Green IT can deal with the environmental and economical challenge to fulfill stakeholder’s need. Much of the literature has provided practical examples on how organizations adopted green service practices and achieve better organizational performance. However, how to motive organizations to adopt Green IT for environmental sustainability is lacking of exploring.
Technology adoption frameworks address the technological related determinants of the adoption and diffusion of innovations [14]. Different models are developed for IT adoption. The most used technology adoption models by researches are following frame works: Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Unified Theory of Acceptance and use of Technology (UTAUT), Diffusion of Innovation (DOI), Technology-Organization-Environment (TOE) framework and Perceived e-readiness model (PERM) [15]. These models have differences in terms of their focus and are designed to examine different aspects of business technology adoption. [16] While DOI and TOE models focus organizational aspects, TAM, TPB and UTAUT models focus on individual aspects.

Molla [17] poses a new model (GITAM) relating to the adoption of green IT based on existing innovations and adoption models. GITAM as shown in figure 1 poses that an organizations intention to adopt Green IT and the adoption of green IT is influenced by factors such as Green IT context, Green IT Readiness and Green IT Drivers. The Green IT context represents the primary characteristics that are inherent in the adoption context and can be assessed relatively objectively. The Green IT context includes - Technological context, Organizational context, and Environmental context. Green IT Readiness [17] captures a dynamic assessment of an organization’s own and environment preparation to accept Green IT. It captures the perceptual characteristics of the adoption context [17]. Green IT Readiness is identified as Perceived organizational Green IT readiness, Perceived value network Green IT and Perceived Institutional Green IT Readiness. Three drivers of Green IT can be identified: economical, regulatory and ethical. Although these drivers are not necessarily mutually exclusive, the prevalence of a dominant driver can influence the content and process of Green IT initiatives and can favor certain Green IT practices.

Figure 1: The Green IT Adoption Model (Molla, 2008)

Based on above model, following hypothesis is formulated.
H1. Green IT Context is positively related to Green IT Drivers in UAE.
H2. Green IT Readiness is positively related to Green IT Drivers in UAE.
H3. Green IT Drivers is positively related to Intention to Adopt Green IT in UAE.
H4. Green IT Context is positively related to Intention to Adopt Green IT in UAE.
H5. Green IT Readiness is positively related to Intention to Adopt Green IT in UAE.
H6. Intention to Adopt Green IT is positively related to Green IT Adoption in UAE.
H7. Green IT Context is positively related to Green IT Adoption in UAE.
H8. Green IT Readiness is positively related to Green IT Adoption in UAE.

3. RESEARCH METHODS

The structured scale was taken after extensive literature review. The green IT driver section of the survey questionnaire was adapted from the existing instrument developed by Molla and Abareshi[18]. The green IT readiness section was adapted from the existing instrument developed by Molla [17]. For the other sections of the model, the questions are taken from the scale developed by Houn-Gee Chen [19]. The questions were structured using 5-point Likert scale which ranges from strongly agree 5, agree = 4, neutral= 3, disagree = 2 and strongly disagree = 1. Questionnaire was distributed to 100 respondents which were selected by convenience method of sampling in UAE. Out of these 100 questionnaires, 91 are considered as complete and retained for further data analysis. Others were discarded on account of incomplete information. The reliability of questionnaire is tested using Cronbach alpha test using SPSS 20 which was .954 which is highly acceptable as a rule of thumb [20].

4. ANALYSIS

Researchers used AMOS 20 to check the relationship between various variables. In this research, First measurement model is developed which is part of confirmatory factor analysis and then Structural equation modeling or path analysis is used to check the hypothesized relationship. Measurement model is used to check the relationship between observed variables and constructs.

4.1. Measurement Model

Measurement model defines the relationship between measured or observed variables and constructs or factors. In this model, all constructs are interdependent and treated as exogenous variables. After getting several models, researcher considered the following measurement model. The goodness-of-fit indices for this model are given below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-Square</th>
<th>df</th>
<th>Normed Chi-Square</th>
<th>RMSEA</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Model</td>
<td>273.920</td>
<td>142</td>
<td>1.929</td>
<td>.067</td>
<td>.943</td>
</tr>
</tbody>
</table>

The models have normed chi square of less than 3. RMSEA values are also less than maximum of 0.08 and CFI is greater than minimum required value of 0.90. In the current study, the researchers have used CFI as incremental fit index and chi-square, normed chi-square, Root Mean Square Error Approximation as used to test absolute fit index of data. This model is achieved by removing unacceptable items with low factor loadings usually less than equal to 0.5, preferably with factor loadings value is 0.70 and above.

Table 2 shows that the values of correlation coefficient between the various factors. The values shows there exists internal relationship between the variables also. That means there exists correlation between Green IT Context, Green IT Readiness, Green IT Drivers, Intention to adopt Green IT and finally Adoption of Green IT. The correlation values show that there exists a significant relationship between Green IT Context, Green IT Readiness, Green IT Drivers, Intention to Adopt Green IT and Green IT Adoption.
4.2. Structural Model

Again the absolute fit and incremental fit indices are used for goodness-of-fit test and path coefficient for analyzing the reliability of paths hypothesized. The goodness-of-fit indices that are absolute and incremental indices for the structured model are given below.

**Table 3: Fit indices for Structured Model**

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-Square</th>
<th>df</th>
<th>Normed Chi-Square</th>
<th>RMSEA</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured Model</td>
<td>273.920</td>
<td>142</td>
<td>1.929</td>
<td>.067</td>
<td>.943</td>
</tr>
</tbody>
</table>

The above table shows that the structured model has absolute indices (Normed chi-square and RMSEA) are less than 0.3 and increment indices is greater than 0.9 which confirms the goodness-of-fit of the model. The statistics are same as those of the best fit measurement model used for structural model.

**Figure 2 Structural Model**

The test of the structural model includes estimating the path coefficients, which indicate the strengths of the relationships between the independent and dependent variables. The overall results of the analysis are shown in Figure 2. The significance
level is 95%. Path coefficients are used to test the hypothesized relationships between dependent and independent variables. Accordingly, following hypothesis are accepted

H1: Green IT Context (path coefficient = .51) is positively related to Green IT Drivers in UAE.

H2. Green IT Readiness (path coefficient = .55) is positively related to Green IT Drivers in UAE.

H3. Green IT Drivers (path coefficient = .54) is positively related to Intention to Adopt Green IT in UAE.

H4. Green IT Context (path coefficient = .63) is positively related to Intention to Adopt Green IT in UAE.

H5. Green IT Readiness (path coefficient = .65) is positively related to Intention to Adopt Green IT in UAE.

H6. Intention to Adopt Green IT (path coefficient = .69) is positively related to Green IT Adoption in UAE.

H7. Green IT Context (path coefficient = .71) is positively related to Green IT Adoption in UAE.

H8. Green IT Readiness (path coefficient = .73) is positively related to Green IT Adoption in UAE.

5. DISCUSSION AND CONCLUSION

The results of the study will contribute to the factors which motivates the organizations in UAE for the adoption of Green IT. The study adopted the GITAM model to check the impact of factors for green IT adoption. The results indicates that Green IT Context and Green IT Readiness positively affect the Green IT Drivers that include economical, regulatory and ethical drivers but the affect is more with respect to Intention to adopt Green IT and Green IT Adoption variables. The results shows that Green IT Readiness which is categorized as Perceived organizational Green IT readiness, Perceived value network Green IT readiness, Perceived Institutional Green IT Readiness should be considered first to take decision related to Adoption of Green IT. Green IT Context which includes Technological context, Organizational context and Environmental context also motivates the organization to adopt Green IT. The findings are useful for researchers and academicians also as this study provide the grounds to explore the factors of adopting Green IT in detail in UAE. The results of the study are significant for the policy makers and to the UAE government also.

This study is not without limitations. The results of the study can’t be generalized as the study is conducted only in UAE. Secondly, the findings need to be confirmed with large sample size. Thirdly, the future research is required to check the impact of each factor of Green IT Context and Green IT Readiness on each Green IT Drivers and on Intention to Adopt Green IT.

REFERENCES


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