
HOW TO FOSTER GREEN IT IN SAUDI ARABIA HIGHER EDUCATION

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ABSTRACT

The adverse environmental effects attributed to the phenomenon of global warming have led to a global tectonic shift to green technologies. Subsequently, various studies have been conducted around the world to assess the level of awareness of "Green IT." This study explores the level of awareness, practice, and adoption of Green IT among staff members and students drawn from 3 universities in Saudi Arabia. The purpose of this study is to provide answers to the questions raised above. The paper will specifically explore the level of IT penetration in Saudi Universities and the impact it has on the lives of computer users. The paper will also assess the level of Green Computing awareness among the IT users in the country. Moreover, it will provide recommendations on strategies that can be adopted to facilitate the effective implementation of Green Computing in Saudi Universities. The paper achieved its objectives by collecting data on the entrenchment and popularity of IT technology among students in institutions of higher education in Saudi Arabia. The study employed interview questions to collect data on the level of awareness of environmental sustainability of Green Computing and the negative effects of IT. The study established that there is a knowledge gap among the IT users in Saudi on the efficacy of green technologies and the associated gadget in optimizing the computational needs. The study observed that a high level of awareness on Green Computing has the potential to trigger behavioral change while at the same time increasing the entrenchment of Green Computing in Saudi Arabia.

KEYWORDS: Saudi Universities, Green Computing, Awareness, eco-friendly practices

1. INTRODUCTION

The concept of green computing is defined as the practice of utilizing computing resources efficiently (Batlegang, 2012). The phenomenon of green computing is also defined as the science of efficient use of environmental friendly computing resources. The concept of green computing is increasingly finding popularity beyond environmental organizations.

In essence, the global tectonic shift towards environmental-friendly technologies has led to more governments, businesses, and tertiary institutions paying attention to the concept of Green computing (Birchi, 2015). The fundamental objectives of the Green computing include the promotion of recyclability and biodegradability of waste, the reduction of hazardous products, and the optimization of energy efficiency of products during their lifetime (Limova, 2016).

The fundamental principle of Green computing is to minimize or eliminate the environmental impacts of IT products throughout their lifetime. The manufacturers of the IT products such as computers are increasingly improving the eco-compliance of their products to minimize their effects on the environment and the users. The computer manufacturers are especially employing environmental-friendly and energy efficient materials to minimize the negative effects of their products on the users (Tushi et al., 2014). The increased competition on Green computing is facilitating computer manufacturers to implement robust environmental management systems while at the same time increasing their compliance with environmental laws and regulations. The manufacturers of IT products increase the eco-friendliness of their products by incorporating features such as virtualization software, sleep mode and power off capabilities, and efficient communication protocols to minimize power consumption. Moreover, the manufactures of the IT products utilizes materials that facilitate recycling to minimize the environmental impacts of their products. The use of recyclable material facilitates the extension of the lifespan of the IT products. The implementation of Green computing is limited by various factors which include cost, lack of standardization, low return on investment, the low global popularity of green computing, and the low efficiency of the products (Dookhitram et al., 2012). Moreover, studies show that more than 70% of the potential consumers of eco-friendly IT products require proof of their effectiveness in promoting businesses and the environment before committing to make purchases. However, the manufacturers of the IT products are striving to overcome the challenges that limit the adoption of Green Computing by making use of energy efficient, environment-friendly, and recyclable materials while at the same time increasing their compliance to quality standards. In essence, the increased innovation on the IT products minimizes their negative effect on businesses and the environment (Batlegang, 2012).

On the other hand, the consumers of environmental friendly IT products are enhancing green computing by adopting eco-friendly actions such as embracing cloud computing, virtualization software, laptops, duplex printing, and switching off machines when not in use.

The increased adoption of cloud computing plays a critical role in enhancing the uptake of the green computing (Orgerie et al., 2010). Moreover, the adoption of cloud computing by organizations has the potential to provide them with optimal green computing tools (Ahmand et al., 2013). The popularity of the green computing has seen an upsurge in the number of Universities conducting pilot projects to increase the level of awareness in public. The faculty of IT in a private University in South Africa enhances its green computing by employing a novel method for facilitating the moderation of its IT modules by scanning and uploading the marked scripts to websites that are then accessed by the moderators (Kasemsap, 2017). In addition, the George Washington University has initiated several eco-friendly initiatives that help it to meet its own goals and the provincial regulatory requirement on environmental and social accountability.

The University enhances its compliance with environmental and social accountability by developing resilient management systems, research processes, and teaching methods (SaveOnEnergy, 2017). On the other hand, the University of Tokyo increases its compliance to green computing by incorporating sustainability practices in computing education at undergraduate level which increases the level of awareness of green computing among the students. The university achieved its objectives by safe commuter cycling and rolling out an undergraduate course on green computing, re-designing the available courses, and incorporating green computing modules into the existing courses (Bridgestock, 2012).

The purpose of this paper is to conduct a study on the levels of awareness of the green computing among students from three universities in Saudi Arabia. The paper is divided into six distinct sections with each section designed to meet specific objectives. Section II of the paper explores the background of IT implementation in institutions of higher learning in Saudi Arabia. The section is concluded by determining the energy consumed by the total number of computers in three Saudi universities. Section III presents the discussion of the methodology employed to collect and analyzes data. The sections discusses the design and structure of the interview questions that were used to assess the level green computing awareness among the management staff and the employees of the IT departments of each university involved in the study. Section IV discusses and interprets the finding of the study. Section V and VI present the recommendations and the conclusion of the paper respectively.

2. BACKGROUND

The high number of computers in businesses and organizations contribute a significant amount of electrical load. The inefficient use of computers in business premises increases the energy burden of business organizations. Studies show that the poor optimization of the majority of desktops computers leaves them idle for an extended period which leads to increased consumption of power (Agarwal, 2014). The increased adoption of computers in the last decade has transformed the administrative and academic landscape of the three targeted universities. The three universities have a combined possession of 20, 000 computers.

The operation of the personal computers (PC) utilizes a significant amount of energy which increases the energy burden of the three universities.

The need to regulate the temperature of the computers winters and summers increases the amount of power used to support their optimal functionalities. A typical desktop personal computer system consists of three main components which include the central processing unit (CPU), the printer, and the monitor. The power rating of a CPU and a 15 to 17-inch monitor ranges from 50 to 150 watts (Cameron, 2010). The traditional laser printing has an on load power rating of approximately 100watts but it is much less when on sleep mode. On the other hand, the Ink Jet printers have an on load power rating of 12 watts and a sleep mode power rating of 5 watts. The above rating shows that a typical desktop computer system can have a combined power rating ranging between 110 to 300 watts (Joumaa & Kadry, 2012).

The operation of the conventional computer systems consumes a significant amount of power which contributes to environmental degradation. Studies show that IT-related products account for 2% of the global carbon dioxide emissions (Limoya et al., 2016).

Therefore, this research paper was prompted by the lack of adequate information among computer users and students on the negative impact of IT products to the environment. The main objective of the paper is to assess the awareness level and suggest steps to incorporate Green Computing into Saudi universities core services and operations.

3. METHODOLOGY

The study utilized both the primary and secondary research methods to gather data required to meet its objectives. The primary data was collected using the interview method which was conducted among the students and staff members in three Saudi universities. The interview employed semi-structured questions to gather more data on the level of green computing awareness among students and employees of the Saudi Universities.

The interview was divided into two major parts which included the evaluation of the interviewees' behavior and the testing of their proficiency in green computing vocabulary (Batlegang, 2012). The interview employed ten simple questions to assess the respondents' level of green computing awareness on operating the printer and buying a new computer. The study interviewed 116 participants who included students and other computer users from the three targeted universities. Moreover, another set of interview questions was designed to gather data from the management staff and the personnel of the IT departments of the three Universities. The interview method was employed to establish the presence of the green initiatives and the level of implementation of green policies that enhances sustainable environmental. The study collected secondary data by reviewing publications and government reports. The use of both the primary and secondary research methods allowed the study to approach the research question from different angles which increased the understanding of the topic being explored.

4. RESULTS AND DISCUSSION

The preliminary results and discussion of the study provide general data on the level of green computing awareness and initiatives that enhance green computing in institutions of higher learning in Saudi Arabia. The analysis of the interview responses shows that 94.9% of the respondents utilize computers in their campuses. The results further show that 100% of the teaching faculty members prefer the use of laptops due to its ease of portability compared to the

desktop computer. Moreover, the study established that 57% of the participants utilize their computers between 4 to 8 hours per day while 43% of the respondents use their computers for more than 8 hours per day. The analysis of the data shows that 30% of the participants own more than one laptop or desktop computer while 70% of the participants have one computer which is either a desktop computer or a laptop. The study established that more than 60% of the staff from the three universities uses screensavers on their desktop computers or laptops.

On the other hand, 68% of the students do not use screen savers on their desktops or laptops. The analysis of the data provided above shows that the university staff members spend more time on their computers compared to the students. Additionally, the study shows that 69.8% of the participants utilize other computing devices such as scanners and printers. Moreover, the study noted that the participants printed an average of 25 pages per day. The findings of the study lead to the conclusion that a higher percentage of the participants have low knowledge on the aspect of green computing. The analysis of the responses observed that only 39.6% of participants were able to provide the correct answers to the interview questions. On the other hand, 60.4% of the respondents failed to provide satisfactory answers to the interview questions.

The analysis of the above observation leads to the conclusion that the majority of staff and students in Saudi Universities have minimal knowledge on the aspects of Green Computing. The study noted that the majority of students and staff are not privy to eco-friendly practices such as switching off their computing devices when not in use. In addition, the study noted that 60.2% of the participants had not heard the term “Green Computing” before the interview. However, 39.8% of the respondents agreed they were aware of the concept of green computing. Moreover, the study observed that 61% of the participants had no idea on the benefits of green computing. The analysis of the responses showed that 82% of the participants exhibited the willingness to switch off their computing devices when not in use to save power and minimize environmental degradation.

On the other hand, 18% of the participants failed to show the willingness to switch off their computing devices when not in use. The responses generated from the participants show that there is a high level of computer literacy in Saudi universities.

The research shows that the high penetration of internet connectivity in Saudi universities facilitates the growth of social networking sites which are the major sources of information on Green computing.

The low level of awareness on aspects of green computing among students and staff in Saudi universities is acceptable because the concept of green computing is still in its infancy stage. However, the study observed that the poor adherence to eco-friendly practices such as using screen savers or switching off computing devices when not in use limits the penetration of green computing in Saudi universities. The study further observed that both the staff and the students who participated in the interviews exhibited a positive attitude towards the green computing as a tool for enhancing environmental sustainability. In addition, a significant percentage of the participants showed the willingness to increase their compliance with green computing. However, 30% of the participants gave neutral responses on their commitment to strengthening compliance to green computing. The results of the study show that the concept of green computing is new among the students and staff of Saudi universities. Therefore, there is a need to formulate strategies that increases the awareness and penetration of green computing practices among students and staff in Saudi universities. We recommend Saudi universities to set up a sustainability web resource to provide students and staff members with helpful tips on e-waste management, energy saving practices, and their benefits in enhancing green computing.

In addition, the universities must formulate save energy strategies that attract the participation of all stakeholders in enhancing efficient e-waste management and energy saving practices to increase their compliance with green computing. They must adopt awareness raising events that employ persuasive and motivating practices to popularize the concept of green computing among the students, the management, and the general staff. Finally, the universities must also develop mechanisms for identifying short-term and long-term behavioral changes that can be exploited to increase the penetration of green computing in Saudi universities.

5. CONCLUSION

This study was motivated by the increasing correlation between energy consumption and the adoption of IT products. The main objective of the study was to assess the level of green computing awareness among students and staff in Saudi Universities. The study achieved its objective by exploring and analyzing the level of entrenchment of green computing practices among computer users and IT students in three Saudi universities. Moreover, the study measured the attitude of the participants towards the concept of green computing and their willingness to adopt eco-friendly practices. The results of the study noted that there is a huge information gap on the role of green computing in enhancing the social and environmental sustainability. Additionally, the study observed that a higher percentage of the university staff and students lack adequate knowledge on the concept of green computing. The results of the study indicated that the majority of the participants exhibit the willingness to adopt practices that improve their compliance to green computing.

The research established that the adoption of various strategies for regulating power consumption by IT products has the potential to enhance green computing in Saudi universities. In addition, the study observed that the adoption of persuasive and motivating marketing campaign has the potential to change the attitude of computer users and students on the issue of green computing.

The research further established that the formulation of strategies that increases the participation of all stakeholders in adopting eco-friendly practices has the potential to reduce the amount of carbon dioxide gas emissions attributed to computing devices.

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