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Research paper

Green IT: an Awareness Survey Among Academicians and Administrative Staffs in Malaysian Public Universities.

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Abstract

IT plays an important role in human life and industry in the whole world such as in manufacturing, transporting, medical, tourism and education. However, IT became one of the contributors to the Carbon Dioxide (CO2) emission that cause global warming. To reduce CO2 emissions by IT device, Green IT had been introduced. Green IT is an activity or action that being used and implemented to minimize the harmful of IT devices to the environment. The government of Malaysia had introduced Green IT in Malaysia since 2009. Despite of that, the awareness level of Green IT among Malaysian is still low and empirical study regarding Green IT awareness among academician is still unexplored. This paper study on the awareness regarding Green IT among academicians and administrative staffs in public universities. There were 245 academicians and administrative staffs were involved as respondents. Descriptive statistics had been used in this study. Overall, the finding shows that the level of Green IT awareness among academicians and administrative staffs was at moderate level. Finally, some issues had identified as barriers to the implementation of Green IT in the public universities such as lacking of support from staff, unrealized the existence of Green IT guideline, and lacking of enforcement. Some initiatives should be done to educate people and enhance their awareness about Green IT.

Keywords: *Green IT, awareness, global warming, barriers, implementation, guideline.*

1. Introduction

Information Technology (IT) is one of the technologies that growth rapidly in this century. Every field in this world needs IT to enhance the productivity and make their life easier from day to day. Even though the economy of Malaysia is still unstable due to the global drops in oil and gas prices, the government of Malaysia had attempted to enhance citizen's life by providing them a good infrastructure for IT. In Budget 2017, around RM 1 million had been allocated for the purpose of expanding the coverage of broadband to 20 Mbps for the whole country and enhance the speed of broadband for public universities to maximum 100Gbps [1].

Furthermore, around RM 162 million had been allocated for IT programs focusing on e-commerce and other digital programs conducted by Malaysia Digital Economy Corporation (MDEC). As a result, there was a drastic growth of IT user in Malaysia whereby it was represented in Figure 1. During 2015, there were 71.1% of Malaysian were internet user which were increase from 57% in 2013. Then, the percentage of computer users also increased from 56% in 2013 and 68.70% in 2015. The number will be increase rapidly with the evolution of the IT in the future [2].

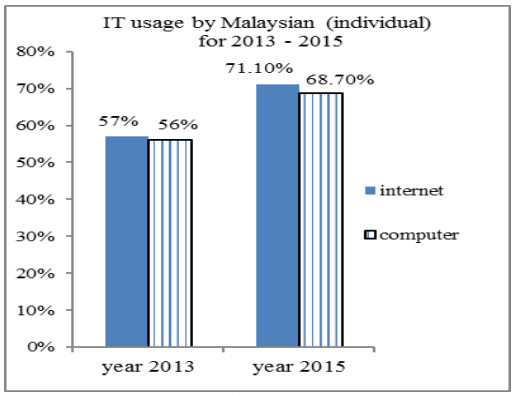


Diagram 1: Number of IT users in Malaysia.

Despite of the increasing of IT users in Malaysia, there were carbon dioxide (CO_2) emissions contributed by IT usage that can effect to the environment. Carbon dioxide (CO_2) is one of the gases that caused global warming phenomenon. Based on Gartner, IT devices had contributed at least 2% of CO_2 emission which was equal to aviation industry [3]. However, the contribution of CO_2 by IT devices is not realized by most IT user. In Malaysia, the government had promised to give full commitment in order to reduce the 40% of CO_2 emissions during 2020 which was represented by Malaysia's Prime Minister, Dato' Seri Najib Bin Tun Razak at Copenhagen, Denmark in 2009.

In order to reduce the impact of CO2 in Malaysia, the government had introduced Green Technology to be implemented by govern-

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ment sector. This responsibility had being given to Ministry of Energy, Green Technology and Water (KeTTHA) to enhance awareness and promote Green Technology to the citizen. Green Technology can be described as the process of manufacturing and developing sort of products, equipment and system to conserve the environment by minimizing negative impact of human activities [4]. One of the initiatives introduced by KeTTHA was Green IT which also known as Green Computing.

Objectives of Study

The objectives of this study:

a) To identify the Green IT awareness among academicians and administrative staffs in Public Universities in Malaysia.
b) To identify the main barriers to implement Green IT at working place in Public Universities in Malaysia.

2. Literature Review

Green IT is one of the initiatives that being introduced to reduce CO_2 emission by IT device. It contains any practices, actions or activities by using IT device that can reduces the CO_2 emission and minimize any harmful effect to the environment that was produced by human activities [5]. Green IT contains four major elements such as manufacturing and production of computer resource, design of computer resource, usage of computer resource and disposal of computer resource that were illustrated in Figure 2. Green IT can be looked as a saviour of the CO_2 emissions produce by IT industry and become the ideal way to save the environment [6].

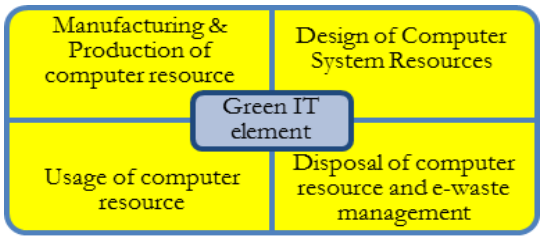


Diagram 2: The four main elements in Green IT.

Malaysia had been introduced to Green IT since 2009, but the pervasiveness of Green IT among Malaysian is very slow and can be assigned as an alarming condition. A lot of research had being done to explore the concept of Green IT and its implementation. Most of the research that being conducted were focusing on the need of Green IT which done by Fairweather [7], Gobinda [8], David and Amy [9], Vittorio [10], Alex M [11] and Ina F [12], whereby the readiness of Malaysia's organization to implement Green IT had been studied. Then, the adoption of Green IT at the organization and the strategy to implement Green IT had being highlighted by Dana [13] and Ranjit and Xin [14]. Even though there were a lot of research done in Green IT, awareness is the most important and crucial part that should be highlight. Awareness is the first stage that should be undertaken to ensure the implementation of Green IT. The high level of awareness is needed to make the environment greener in the developed nation [15]. Green IT awareness is very important as it will reflect to the Green IT practice that will be implemented by a person [16].
Green IT awareness level had been studied by many researchers with many types of respondents as shown in Table 1.

Table 1: Researches done regarding Green IT awareness

ID	References	Type of Respondents	Country	Finding
P1	Dookhitram K. et al [17]	University's student	Mauritius	Green IT awareness of students was at moderate level and their practice was at not satisfactory level.
P2	Batlegang B [18]	University's student	Africa	Green IT awareness of students was at low level and Green IT course should be conducted.
P3	Minsani M. and Karen M. [19]	Organization's staff	Indonesia	Green IT awareness of staff was at moderate level and some initiatives should be undertaken to increase the awareness.
P4	Roopali J [20]	Bank's Employee	India	Green IT awareness of employees was not adequate and five factors had been identified that gave influence to the awareness.
P5	Henk,P et al [21]	University's student	Netherlands	Green IT awareness of students at moderate level and can be increased by conducting Green IT course.
P6	Badariah T.A et al [22]	University's student	Malaysia	Most of students were lacking aware about Green IT especially Green IT term.
P7	Noorriati D. et al [23]	University's student	Malaysia	Green IT awareness of students was at moderate level and Green IT should be promoted to increase the awareness.
P8	Franklin W. et al [24]	IT's staff	Kenya	Green IT awareness of staff was at low level and some initiatives should be undertaken to increase the awareness.
P9	Sangita B.R et al [25]	University's student	India	Green IT awareness of students at low level
P10	Selmayani S and Ahmad N [26]	University's student	Malaysia	Green IT awareness of students was not satisfactory level and Green IT curriculum should be developed.
P11	Rajendra K.B et al [27]	University's student	India	Indian students were adequately aware about Green IT and their concern was about reducing cost through Green IT.
P12	Emmanuel F [28]	Faculty Members, Administrative staff and Students in Universities.	Ghana	Green IT awareness among the faculty members, administrative staff and students were at low level.

Based on the Table 1, all of the researches listed were empirical research and using quantitative method. As a result, most of the findings show the Green IT awareness level among respondents were at low level as stated in P2, P4, P6, P8,P9,P10,P12 where else the other five papers show that Green IT awareness level among respondents were at moderate level. This situation is considered as alarming condition as the target to reduce 40% CO_2 emissions must be achieved in 2020. Furthermore, the respondents involved in the research done as listed in Table 1 were University's students which equal to 66.7% of total research listed. Another 33.3% respondents were come from staff, bank's employee, and faculty members. Only one research had been conducted among faculty members or academician as listed in Table 1. Then, there were three researches had been conducted in Malaysia which focusing on university's student as stated in P6, P7, and P10.
Therefore, the chosen respondent for this study were academicians and administrative staffs at public universities in Malaysia which not being explored widely in Malaysia context. The academicians and administrative staffs were also IT user that using IT devices to complete their task in the university. As academicians, they also have responsibility to promote and educate students regarding Green IT as they become a role model to the students. If the academician's awareness about Green IT not being assess, it may effected to their practice daily regarding Green IT.

3. Research method

This study was conducted in five (5) public universities located in Johor, Malaysia. There were 245 of academicians and administrative staffs were selected as the respondents. The population chosen was academicians and administrative staffs that using IT device in their daily life. There were around 2200 of academicians and administrative staffs in the population. The sample that suitable to represent the population is equal to 242 [29]. Then, a set of questionnaire had been distributed to 345 of the academicians and administrative staff based on stratified random sampling.

The questionnaires were distributed by researcher with an assistant at the universities by sending it to academician's pigeon hole. For each university, there was a person in charge (PIC) that become as a representative that will ensure the questionnaire being filled and collected. Then, a week later, the questionnaire will be collected by researcher. The response rate for the questionnaire collected was equal to 71.01% whereby 245 set of questionnaire had been completed by the respondents.

The questionnaire consists of some part such as profile of respondents, Green IT awareness and perception about the barriers of Green IT implementation in their workplace. The respondents need to read and self-rating themselves regarding their concern about impact of IT device towards environment.

4. Result and Discussion

Profile of Respondents

The respondents involved in this study were 61.2% of female and 38.8% of male. Most of the respondents were Malay (96.3%), Chinese (1.6%), Indian (1.2%) and other race (0.8%). Then, there were 62% of the respondents were administrative staffs and 38% of the respondents were academicians. For the year of services, 25.7% of the respondents had working for less than 3 years and closely followed by working for 3 until 6 years (25.3%). Next, 13.9% of the respondents were working for 7 until 9 years and 35.1% of the respondents had working for at least 10 years. It shows that the respondents were consisting of workers from multiple generations of people. About 52.3% of the respondent had SPM certificate until diploma and 47.7% of respondents had degree until doctorate for their education level.

Detail Result

All the data gathered were analyzed by using Statistical Package for the Social Science (SPSS) version 20.0. All the percentages and means were listed in Table 2. The 5-level of Likert's scale were used as the self-rating value. Overall, the highest mean were come from Item 9 which consist of the respondent's agree that as a public servant, they have to support the government policy including Green IT implementation which its mean equal to 4.02. In contrast, the lowest mean was Item 5 (2.53) which consists of agreement regarding the exposure about Green IT guideline by IT department or institution. This result shows that most of the respondents do not realize about the existence of Green IT guideline introduced by MAMPU which should be highlighted by IT department and top management of all government agencies including public universities.

Table 2: Green IT awareness among academicians and administrative staffs

Items	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree	Mean
I know the existence of National Green Technology Policy	6.9%	11.8%	30.2%	33.5%	17.6%	3.48
I understand the content of Green IT Guideline	13.5%	25.7%	36.7%	20.0%	4.1%	2.76
I know Green IT is related to the usage of IT device efficiently in order to reduce CO_2 emission	7.8%	11.8%	32.2%	37.1%	11.0%	3.32
I had been exposed about Green IT Guideline by one of the department in my institution	19.6%	31.4%	28.2%	18.0%	2.9%	2.53
I know that Green IT Practice can reduce the utility cost in my organization and sustainable the environment	5.3%	10.6%	26.5%	39.2%	18.4%	3.55
I always saw the advertisement about Green IT and concern about it	2.4%	20.8%	36.3%	25.7%	14.7%	3.29
I feel Green IT implementation is also our responsible, not just IT Department responsible only	3.3%	13.5%	26.9%	29.4%	26.9%	3.63
I agree that each of public servant has to support government policy and effort including the Green IT implementation	1.6%	3.3%	17.6%	46.5%	31.0%	4.02
I realize that as a government servant, I have to implement Green IT as mentioned in the Green IT Guideline	1.2%	5.7%	15.1%	51.8%	26.1%	3.96
I always read the content of Green IT Guideline that being introduced	14.7%	28.6%	32.7%	23.3%	0.8%	2.67
I know that the government's aimed to reduce the CO2 emission towards year 2020	8.2%	24.5%	36.7%	20%	10.6%	3.00
I feel clear about my responsibility to fully implement the Green IT Guideline	8.2%	15.1%	42.0%	29.8%	4.9%	3.08
My leader always remind me to use IT device wisely	14.3%	18.0%	29.4%	32.7%	5.7%	2.98
IT Department in my organization always remind all of the staff to ensure IT usage compliance with the Green IT Guideline	12.7%	22.9%	33.9%	27.3%	3.3%	2.86
Top management in my institution always exchange their opinion with all the staff regarding the best way to reduce the utility cost especially IT device usage	12.7%	26.9%	31.4%	24.9%	4.1%	2.81
My organization had been conducting a campaign to give awareness about Green IT	15.5%	27.3%	31.4%	23.3%	2.4%	2.70
Top management had been present the utility cost for electricity usage for IT device such as computer	15.5%	25.7%	29.4%	24.9%	4.5%	2.77
Top management in my institution had presented a report regarding non-efficient computer usage	13.1%	22.0%	35.5%	25.7%	3.7%	2.85
I realize that my organization is alert about energy-efficient product when doing the computer purchasing	9.0%	15.5%	34.3%	32.2%	9.0%	3.17

Every mean that were gathered from the questionnaire were being referred into Table 3. The range of mean score is determined based on Table 3 which was calculated by researcher by using statistical formula.

Table 3: Mean Score Table

Level	Mean Range
Low	1.00 – 2.33
Moderate	2.34 – 3.66
High	3.67 – 5.00

The researcher then categorized the mean into three level of awareness: low, moderate and high. Overall mean for this part is 3.12 which showed the level of awareness about Green IT among academicians and administrative staff is in the moderate level. When this mean is converted into percentage, the overall percentage of Green IT awareness among academicians and administrative staffs was equal to 62.4%. This result has shown that at least the academicians and administrative staffs aware and concern about IT impact to the environment.

Barriers and issues of implementing Green IT at the workplace.

In the questionnaire, there was a part that consist of open ended questions that being used to identify the barriers and issues of implementing Green IT at the workplace from the respondent's perspective. As a result, some of the issues had been highlighted and identified as shown in Table 4.

Table 4: Respondent's perspective regarding the barriers and issues of implementing Green IT at the workplace.

No	Barrier and issue
1	Low of awareness
2	Lacking of support by staff
3	No guideline
4	Lacking of exposure
5	No enforcement from the top management
6	Lacking of IT Initiative
7	Unclear about Green IT advantages
8	Lacking of support by top management
9	Decline to change
10	High implementation cost

Based on the barriers listed in Table 4, the barriers written by respondents were listed based on the most frequent to the least frequent whereby the main barrier was low awareness regarding Green IT. Then it followed by lacking support by staff which might cause by their attitude daily at workplace. The existence of Green IT guideline was not being realized as it becomes one of the barriers. Next, lacking of exposure and no enforcement from the top management as every person was very motivated and inspired to do something if they get reward from the actions taken. Lacking of IT initiative, unclear about Green IT advantages and unsatisfactory support from top management were other barriers to implement Green IT. Lastly, the respondents agree that decline to change was one of barriers and they believed that Green IT implementation need high cost to be allocated. These result was similar with a research done by Kavita [30] regarding the barriers to implement Green IT at educational institutional in India.

5. Conclusion

Through this study, the Green IT awareness among academicians and administrative staffs in Malaysian Public Universities had been explored. The level of Green IT awareness among them was at the moderate level and can be improve by promote and pervasive of Green IT in the future. The barriers and issues to implement Green IT in the working place were also being identified in this study. In order to promote and educate people about Green IT, a guideline of Green IT should be explained clearly among citizen especially public servant as they were the catalyst of government policy. Thus, academicians and administrative staffs were become as good example for students to implement Green IT in the public universities whereas they will educate students to be a successful leader in the future. As a successful leader, the students must have knowledge regarding Green IT which will reflect to their practice in daily life in order to save the environment and create sustain community. In addition, a tool to measure Green IT implementation at universities and education institution should be developed as it can shows the current status of Green IT implementation. The target to reduce 40% of CO2 emissions during 2020 can be achieved if all of the parties give the full commitment to implement Green IT.

References

[1] Ministry of Finance Malaysia (2017), Annual Budget 2017. Available from http://www.treasury.gov.my/index.php/en/budget/annual-budget.html

[2] Department of Statistics Malaysia (2016), ICT Use and Access by Individuals and Households Survey Report. Available from https://www.dosm.gov.my/v1/index.php.

[3] G Gartner Gartner (2007), "Going Green : The CIO's Role in Enterprisewide Environmental Sustainability".

[4] National Green Technology Policy (2010), Ministry of Energy, Green Technology and Water. Available from http://www.keetha.gov.my

[5] San Murugesan (2008),"Harnessing Green IT: Principles and Practices", IT Professional, vol. 10, no. 1, pp. 24-33, Jan./Feb. 2008, doi:10.1109/MITP.2008.10

[6] John Lamb (2009)," The Greening of IT: How Companies Can Make a Difference for the Environment", IBM Press/Pearson

[7] Fairweather, N. Ben. (2011). "Even greener IT: Bringing green theory and "green IT" together, or why concern about greenhouse gasses is only a starting point." Journal of Information, Communication and Ethics in Society, 9(2), 68–82. doi:10.1108/14779961111158702.

[8] Gobinda, C. (2011). "How digital information services can reduce greenhouse gas emissions". Journal of Information, Communication and Ethics in Society, vol.36, no.4,pp.489-506, 2012.

[9] David C. Chou and Amy Y.Chou (2012). "Awareness of Green IT and its value model",Computer Standards & Interfaces Vol.34, 2012, pp. 447 – 451.

[10] 10. 10. Vittorio, B. (2010). "Power and Internet". Journal of Information, Communication and Ethics in Society, vol.8, no.4,pp.323-337, 2010.

[11] Alex M. Andrew, (2010),"Going green", Kybernetes, Vol. 39, No.6,pp. 1392 – 1395, 2010.

[12] Ina F.(2012). "A call for libraries to go green". Library Hi Tech, vol.30, No.3,pp.428-435,2012.

[13] Dana Syzdykbayeva (2009). Analytical Study On Adoption Of Green Computing By Malaysian Organizations. Master of Science (Information Technology - Management), Universiti Teknologi Malaysia.

[14] Ranjit B. and Xin R.L.(2011). "Green IT Adoption: a process management approach". International Journal of Accounting and Information Management, vol.20, No.1, pp.63-77.

[15] Noushin Laila Ansari, Mahfuz Ashraf, Bushra Tahseen Malik, and Helena Grunfeld (2010) . "Green IT awareness and practices: Results from a field study on mobile phone related e-waste in Bangladesh". pp.375 – 383

[16] Jailani, S. F. A. K., Kassim, E. S., & Hairuddin, H. (2014). "Green IT implementation strategy: Development of a tracking indicator". Advanced Science Letters, 20(10-12), 2042-2045. DOI: 10.1166/asl.2014.5686

[17] Dookhitram, K. Narsoo, J., Sunhaloo, M.S.,Sukhoo, A. and Soobron,M.(2012). " Green Computing : An Awareness Survey among University of Technology, Mauritius Students". International Conference on Higher Education and Economic Developmet, Mauritius, 2012, pp.1-8

[18] B.Batlegang , "Green computing : students, campus computing and the environment: a case of Bostwana," Journal of Information Systems and Communication, vol.3, no.1, pp.256-260,2012.

[19] Minsani M. and Karen I,(2012). "A Preliminary Study of Green IT Readiness in Indonesian Organizations". Journal of Energy Technologies and Policy, vol.2, no.5,pp. 1-10

[20] Roopali Jain (2012). "A study of Green Computing Awareness Among Bank Employees". Asian Journal of Research In Marketing Vol.1,Issue 1,2012.
[21] Henk, P., Diana B., and Pascal, R. (2013). "A Virtual World as an Introduction to Green IT Awareness". Communications of IIMA, vol.13, issue 2, pp. 53-68
[22] Badariah, T.A., Nordin, M.S., & Bello, A. (2013). "Exploring Malaysian University Student's Awareness of Green Computing". GSTF International Journal on Education, 1(2),92-102.http://dx.doi.org/10.5176/2345-7163_1.2.34
[23] Noorriati, D., Shireen, H., Hashim, A. (2013). "The Level of Awareness on The Green ICT Concept and Self-Directed Learning Among Malaysian Facebook Users". Retrieve from doi.org/10.1016/j.sbs.pro.2013.08.375
[24] Franklin W., Gregory W.W., Stanley, O., Stephen, M.M.(2013). "Pervasiveness of Green ICT awareness amongst Kenyan ICT Personnel". International Journal of Application or Innovation In Engineering & Management, vol.2,no.1, pp.93-103, 2013.
[25] Sangita, B.P., Madhuri, R.G. and Supriya G.S.(2014). "Relative Study of Students Awareness and Usage of Green Computing with Respect to Gender." Journal of Management and Research, vol.3, issue 1, pp.294-310
[26] Selmayani, S. and Ahmad, N.(2015). "Green Computing : The Overview of Awareness, Practices and Responsibility Among Students in Higher Education Institutes." Journal of Information System Research and Innovation 9(3), pp.1-9
[27] Rajendra, K.B., Andi B.,and Ashay S.(2015) "Exploring Green IT Awareness and Adoption Among Indian Students". Proceedings of the 2015 ACM SIGMIS Conference on Computers and People Research. pp.87-96
[28] Emmanuel F.(2016), "Saving the planet : An assessment of Green Computing Practice among Tertiary Institution in Ghana." Proceeding of INCEDI 2016 Conference, pp. 991-1003
[29] Krejeie, R.V. and Morgan, D.W. (1970). Determining Sample Size for Research. Educational and Psychological Measurement,607-610.
[30] Kavita S. and Sammer N. (2013). "Green ICT for Sustainable Development: A Higher Education Perspective". Procedia Computer Science, vol.70, pp.701-707