



GREEN COMPUTING USING RMIT GREEN ICT FRAMEWORK METHOD (CASE STUDY: STIKOM DINAMIKA JAMBI)

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Abstract

This paper presents the application of green computer in STIKOM Jambi dynamics. Green computing is one effective way to reduce the effects of global warming. Educational institutions are one institution that uses large electrical energy. To support the global warming program, Bali Stikom began to apply green computing. This research uses the method of RMIT Green ICT. The result, the application of green computing managed to reduce the burden of electricity costs, reduce operating costs from the data center, and reduce the amount of hardware required. In addition to providing benefits to STIKOM, green ICT also provides environmental benefits. Such as reduction of carbon dioxide emissions, reducing resource consumption, and adhering to prevailing government regulations.

Keywords: green computing, RMIT, green ICT framework

1. Introduction

Green Computing is a movement that requires the Information and Communication Technology (ICT) industry to pay more attention to the environment. ICT is actually not environmentally friendly due to the amount of energy used to operate the ICT equipment, the rising energy costs, as well as the waste generated by these ICT equipment that are not properly processed. According to Hemanandhini [1], Cloud computing is an effective financing of the infrastructure that gives users various access to applications without the need to deploy the hardware required to run the application. This can be supported with virtualization technology. The goal of Green Computing is environmentally friendly ICT, which supports the conservation of resources and the environment, with the ultimate goal of creating a community of ICT users with low-environmental, foot-print societies.

The Government of Indonesia succeeded in incorporating two important agendas in the agreement of the 9th ASEAN ASEAN countries' IIC Ministers Meeting, one of which is ASEAN's strategic policy to promote green computing and reduce waste in the life cycle of computing equipment from initial manufacture, through delivery, maintenance, recycling, and disposal in a realistic economic way.

Computer college is the largest user of electrical energy, it should every high school

computer implement a green computing system to reduce the effects of global warming is increasing as well. Therefore, the development of green computing is expected to be applied in many famous computer schools in Indonesia, one of them is STIKOM Dinamika Bangsa Jambi. At STIKOM Dinamika Bangsa Jambi most of the lecturers use their own built-in laptops or using computers already provided by the university, which is a desktop computer using as much energy as the hardware and software it uses. STIKOM High School has at least 5 computer labs that are used for everyday learning activities and the use of computers in a laboratory where 30 to 40 computers will work simultaneously, will certainly use a lot of energy. Not to mention the use of every 1 computer equipped with 1 CPU, 3 supporting hardware and many software that work in computer. The use of computers in all parts or divisions simultaneously will cause the amount of energy usage in STIKOM to increase relative and can result in the load of electric at the same time.

There is plenty of room for managing renewable energy and waste that can be explored for improvement using a green approach in the computing sector. A number of literatures support that electronic waste management is a viable option for promoting and implementing green computing. Jadav, et. al [2] said that e-waste management is a challenge but can help in the application of green computing. E-waste recycling is one of the most environmentally friendly approaches [3]. Roy and

Bag [4] conducted further research by focusing their research on electronic waste management as a solution to green computing and discussing the role of OEMs and Consumers for a form of green computing movement both globally in an Indian perspective. Anam and Syed [5] presented different technologies used in the management of electronic waste as a approach to green computing.

According Debnath, et.al [6] Green computing is the latest trend, is one of the areas that continues to evolve into a sustainable future. Many methods san approach that has been done related to the use of green computing, such as Virtualization, Cloud computing, Minimization of energy, reduction.

With regard to energy efficiency and natural resources in various factors and also to reduce the effects of global warming, then green computing will be very useful in making it happen. This is what underlies this research further developed.

2. Method

This research uses green ICT Actions model developed by Philipson, G. (2010). Using 4 components, namely: Attitude, Policy, Practice, and Technology. The research also uses The Connection Research - the RMIT Green ICT Framework that takes a holistic view of Green ICT. It contains four vertical components or "pillars", each of which further into a specific area in Green ICT, and five horizontal components, or "actions" that describe a separate approach to vertical. Here's an explanation in more detail:

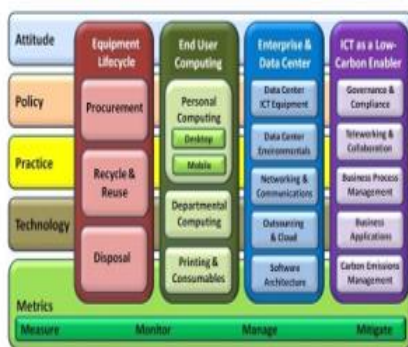


Figure 1. Green ICT Framework

(<https://www.scribd.com/document/78922790/A-Green-ICT-Framework-CR>)

The research framework as shown in the figure. 2 contains an explanation of the stages of the process that will be carried out during conducting research activities. The research framework is made to facilitate the achievement of research results that is

the analysis and implementation of green computing.

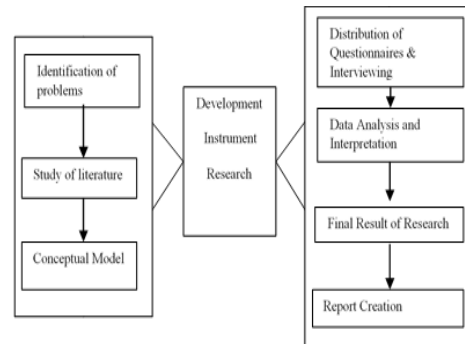
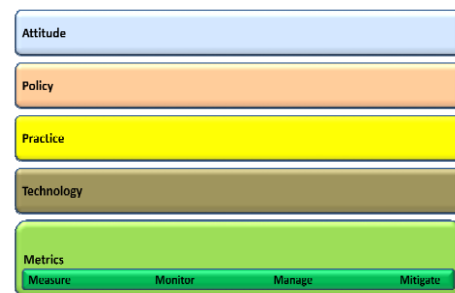


Figure.2 Framework

3. Result and Discussion

The horizontal dimension, or "action", the skeleton has five components. The first four are Attitude, Policy, Practice and Technology. All can be applied in each of the four pillars. This action is broadly based on the first level of RMIT University hierarchy, with the exception that "Metrics" replaces "Governance" RMIT University.

Green ICT Actions



Gambar. 3 Green ICT Actions

From the pillars in the previous explanation below is the Best Practice table resulting from the grouping of Green IT Actions according to RMIT Green ICT Framework:

Table 1. Green IT Actions Grouping (Attitude)

Attitude	Best Practice
1. Procurement	In cooperation with Green Vendor.
2. Recycle	Recycling electronic waste that can still be used.
3. Reuse	Use waste paper to print drafts.
4. Disposal	It has a special unit that is responsible for handling electronic waste.



5. Desktop	Disable the active Screen Saver program.
6. Mobile	Enable the power saving setting to keep the battery last longer.
7. Department of Computing	Using a terminal server.
8. Printing and Consumables	Use both sides of the paper for printing and photocopying (<i>Duplexing</i>).
9. Data Center ICT Equipment	Using Air Conditioner (AC) on the server.
10. Networking and Communications	Communicating via online chat.
11. Software Architecture	Designing algorithms to be more efficient.
12. Government and Compliance	Print multiple pages on 1 sheet of paper.
13. Teleworking and Collaboration	Using scraps of scrap paper.
14. Business Process Management	Make copies of your own information.
15. Printing and Consumables	Use both sides of the paper for printing and photocopying (<i>Duplexing</i>).
16. Data Center ICT Equipment	Using Air Conditioner (AC) on the server.
17. Networking and Communications	Communicating via online chat.
18. Software Architecture	Designing algorithms to be more efficient.
19. Government and Compliance	Print multiple pages on 1 sheet of paper.
20. Teleworking and Collaboration	Using scraps of scrap paper.
21. Business Process Management	Make copies of your own information.
22. Business Application	Running Green ICT based business applications.
23. Carbon Emissions Management	Purchase equipment that is low in carbon emissions.

Table 2. Green IT Actions Grouping (Policy)

Policy	Best Practice
1. Procurement	Purchase products that have Green certification. Example: EPA,

	Energy Star.
2. Recycle	Choose products whose parts can be recycled and are easy to unravel.
3. Reuse	Use removable and rewritable storage media. Example: Flash disk.
4. Disposal	Using a diskless computer.
5. Desktop	Shut down PC after hours.
6. Mobile	Set the screen time-out on the gadget.
7. Department of Computing	Using a small hard drive.
8. Printing and Consumables	Implement a paperless system for the use of office administration, such as pay slips, forms and official notes.
9. Data Center ICT Equipment	Using an inkjet printer rather than laser jet.
10. Data Center Environmental	Using Green Server.
11. Networking and Communications	Saving E-mail.
12. Outsourcing and Cloud	Using a cloud system from a company that has a Green certification. Example: Microsoft.
13. Software Architecture	Using Green software.
14. Government and Compliance	<i>Preview the document before printing.</i>
15. Teleworking and Collaboration	Sending information via E-mail.
16. Business Process Management	Sending a fax directly from a computer, not a hardcopy.
17. Business Application	Improve efficiency in business applications.
18. Carbon Emissions Management	Doing the system works remotely with video conferencing.

Table 3 Green IT Actions Grouping (Practice)

Practice	Best Practice
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1. Procurement	Purchase product with long warranty guarantee.
2. Recycle	Using recycled goods.
3. Reuse	Better upgrade than a new buy.
4. Disposal	Evaluate Green IT.
5. Desktop	Use LED monitor instead of LCD.
6. Mobile	Do not install the battery on your laptop or notebook when used at home.
7. Department of Computing	Removing unused peripherals on hardware. Example: USB, Modem.
8. Printing and Consumables	Reduce printing with new paper.
9. Data Center ICT Equipment	Designing cables to be more efficient (Cable Management).
10. Data Center Environmental	Using an alternative power supply.
11. Networking and Communications	Communicate in Workgroup.
12. Outsourcing and Cloud	Conduct training for employees to reduce new outsourcing demand.
13. Software Architecture	Installs battery power applications on hardware.
14. Governance and Compliance	Do not use wasteful applications.
15. Teleworking and Collaboration	Provide facilities for long distance communication between employees.
16. Business Application	Run apps only as needed.
17. Carbon Emissions Management	Managing excess carbon emissions in waste yields.

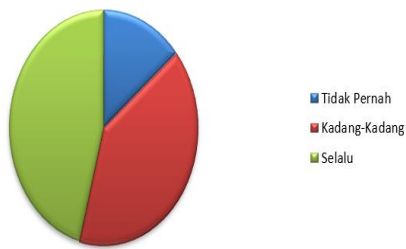
4. Disposal	Buy recyclable products.
5. Desktop	Do not use full color wallpaper.
6. Mobile	Removing the gadget protector when in charge.
7. Department of Computing	Use smaller hardware.
8. Printing and Consumables	Use smaller fonts (consistent with readings).
9. Data Center ICT Equipment	Does not use many cables (Cableless).
10. Data Center Environmental	Use stabilizer to keep electricity consumed stable.
11. Networking and Communications	It's better to send E-mail than to give a draft of hardcopy.
12. Outsourcing and Cloud	Buy a new cloud when capacity is up rather than buying a new server.
13. Software Architecture	Upgrade the software.
14. Governance and Compliance	Reduce printer usage.
15. Teleworking and Collaboration	Implement the Remote Administration system so administrators can monitor with remote access.
16. Business Application	Provide digital information means.
17. Carbon Emissions Management	Using CMS (Carbon Emissions Management Systems) to manage the carbon emissions cycle from waste.

Table 4. Green IT Actions Grouping (Technology)

Technology	Best Practice
1. Procurement	Purchased equipment online (<i>E-procurement</i>).
2. Recycle	Fixed items rather than buying new ones.
3. Reuse	Replacing old product components with new ones (<i>Cannibalism</i>).

With the grouping, we conducted a survey of 841 respondents, with the result Never was 118, Sometimes is 337 and the Last Always is 386. Therefore STIKOM Dinamika Bangsa Jambi has been included in the category of green ICT Actions.

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Picture. 3 Questionnaire Results

In addition, other survey results related to the best check list resume as shown in the figure. 3 with respondents a total of 68 questions with 'Yes' with a total of 52 questions while 'No' for a total of 16 questions. Here is the translation of the results:

- Recycle is a good idea STIKOM DB processing on excess carbon emissions using CEMS (Carbon Emission Management Systems).
- paperless STIKOM DB has done green paper very precisely, and also in
- The data center all the results have been done exactly as well, the rest stay continues to be done better.
- Attitudes have been better done, there are still some parts that have not been done, such as by buying products that have green certification like Energy Star is the beginning in the use of good green computing.
- hardware and software has been done pretty well, but the distribution of green software on STIKOM DB is still not evenly distributed overall computer in STIKOM DB, especially in Laboratory

4. Conclusion

Green ICT benefits many computer users especially, STIKOM DB Jambi. Green ICT reduces the burden of electricity costs, reduces operational costs from data centers, and reduces the amount of hardware required. In addition to providing benefits to STIKOM, green ICT also provides environmental benefits. Such as reduction of carbon dioxide emissions, reducing resource consumption, and adhering to prevailing government regulations.

Green computing can be done by following the existing best practice arrangement. Best Practice can be a clear guide so that it can facilitate in

checking the daily performance, whether the action is already included in the scope of green or not.

Paperless parts that have not been done is to send faxes directly from the computer, not a hardcopy, actually this can be done and not because in order to save paper can be done by sending data via email without using the fax machine and certainly not spend the paper.

On the attitude side there are some things that must be considered, such as establishing cooperation with green vendors, set the screen time out 1-2 minutes, Green IT evaluation every 6 months, purchasing goods through online, and implementing remote administration.

In the software section there are several things that must be considered including running applications based on Green ICT and Green Software.

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