Analysis Of Different Techniques, Applying Concept And Implementation Of Technology To Build Environment Friendly Green University

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Abstract- Today concept of Green Computing is widely used. The issues related to environment are the major problem faced by the world. To save Earth and making environment clean and pollution free, here some of the concepts are discussed in proposed research paper. Advanced in technology and proper implementation of it will result in fruitful environment friendly effects. Green University is an environment friendly university which will not only beneficial to environment but automation of most of the university tasks saves amount of human time, less error prone processes and uses latest technology. Number of process are involved in university like administration, affiliation, admission, enrollment, examination, evaluation, result preparation and declaration, reassessment, degree certificates and many more. By using latest tools and techniques simplifies and automates the process but technology should be utilized carefully. The paper discusses various aspects that improve the university processing and implementation of such concepts results towards the Green University. The use of computers dramatically changed the world today than that was before three to four decades. Computers were used at the initial stage only at large organizations and universities by experts only but technology is at peak point today and it has become a common device that can be operated even by a child. Use of computers and technology is necessity for everyone but it can be used carefully and output oriented. Green computing is a concept to utilize computers environment friendly. Applying Green computing to university processes result in Green University.

Index Terms- Environment, University, Green Computing, Green University, Carbon footprint, Power consumption, Optimization, Technology, Automated process, Green house effect

I. INTRODUCTION

GReen computing is term used for effective and optimizing the computing power that will help in environmental issues in the world of computing. Computers have been reached from research and industry to home. Use of computers is increasing day by day which requires amount of electricity power which creates the issues of energy consumption. Also wastage of computers leaves the carbon footprint that is harmful to environment and creates the issues of environment. Large and plenty of industries produces gas, wastage and materials that effects environment and improper use of computers just adds to environmental issues. Green house effect and ozone layer of atmosphere are the real problem faced by the scientists, engineers and all of us today. It is not possible to stop the processes involved in industries, use of vehicles and use of computers but it is possible to use computers wisely so that it can help surviving from these issues. Effective use of computing power and technologies will add little but t large scale will prove itself. Use of these concepts of environment friendly computing is known as Green computing. Use of Green computing in university will have major impact in every direction. The concept is well known as Green University. By applying and implementing green university at higher level implicitly will effect to corresponding institutes and at last to everything and as a whole effects to entire globe. Green University is a university in which most of the processes are automated. Automation requires computers and latest technologies. Many Universities have started to use of such techniques at some possible level but here is the discussion of major aspects of University at possible extent. From smaller to larger tasks can be computerized as computers have tremendous computing power, saving time, efforts, error free and with considering environmental issues can prove its potential advantages. The paper is organized from effective use of computers to University processes that may establish a true Green University. At last paper is concluded with some future aspects for which research is going on. Green university once established its advantages can be realized for a long run.

II. USE OF POTENTIAL COMPUTING POWER

As per the rules of Thermodynamics, it is not possible to utilize 100% of energy in kind of system. More of less we loss the energy in form of thermal energy, energy wasted using heat generated from the system etc. Also wastage of computers and its peripherals makes environment polluted. Green computing is an area to effectively utilizing the computing power not only saves the amount of energy but also efficiency of the computing can be obtained for long run. Computer is a system being made of hardware which by time deteriorates its functioning as time passes and as being used. We can not stop this natural phenomenal, but we can make precaution to increase the life span of hardware, its functionalities by applying green technologies. Green computing is the utilization of computing power and technology in eco environment manner. Green technology incorporates number of criteria to be applied few of them which are common listed below.

A. Green computing is an application that will optimize the power consumption. The material used for computers preparation should not be harmful with keeping in mind about environment.
B. Wastage of computer products should be made in such a way it can be used in other technology or educational purpose.
C. Carbon footprint of devices should be reduces as it is the cause of green house effect.
D. Keep computing devices cool to reduce the heat energy which impacts on computer functionality. Latest technologies are used for protecting against heat energy.
E. Hard copy on the paper should be avoided if possible. As many documents have footage not "Print only if necessary".
F. Use of LCD monitors reduces the power consumption compared to CRT monitor but again there is a tradeoff between these two technologies.
G. Plugged out the devices from main power source if they are not used for long amount time. Also it is a good thing to switch off devices properly.
H. Use of computers help solving problems but it should be utilized for a long run and maintained properly.
I. It is better to upgrade the computer system than to replace entire system time to time.
J. Use of cloud computing makes it possible to perform task from anywhere anytime.
K. Green computing is more than this which keeps track of maintaining large scale storage devices area to soft computation.

III. GREEN TECHNOLOGY FOR GREEN UNIVERSITY

Green technology in form of applying technology and automation of university activities prepares the base for Green University. University involves number of activities and computerizing each activity adds to achieve the said goal. Following listing represents some basic activities that at some extent are automated in most of the Universities.

A. Administration : Administration, accounting, purchase, maintenance and increasing the facilities of education system and many more such processes can be automated by use of implementing computerized system. Enterprise resource planning is one such an example that automates and makes any transaction called e-transaction that is electronic transaction which makes administration process smooth and paper less which is one of the great advantage over manual system. Further to implement such system over time care must be taken as hardware or software failure may occur. Automated backup facility must be replicated so that even after failure system can resume to function properly. High performance server system should be maintained to store centralized repository of data with back facility and replication to achieve the high level of fault tolerance system. By automated processes and reduced printing of the documents the cost of printing, papers and effects caused by it to the environment can be reduced. It is only possible to achieve such advantages if entire system connected with it is automated. Effects can not be achieved only by not printing a single page or two pages but overall entirely. Most Universities provides web site for interaction and circular for communicating with fellow institutes. Website provides a media for interaction between University and any institute or an individual. Website must be updated and due to increased volume of data day by day as discussed backup facility must be implemented. Use of mailing system notifies the users to complete the task in specific time limit. Online attendance of students and staff members can be made using thumb impression or face recognition system. Special hardware and sensors are requires to implement attendance system. Leave report of faculties and student absent records can be maintained automatically. Each and every information of University actions, introducing new courses, events, seminars, industrial visits, reports of various curriculum activities, research, affiliation, enrollment, examination, evaluation, result declaration, degree certificates, awarding and many more all such activities should be managed and administrated at only one place. Security measures play an important role for performing such secured operations. Each of the above processes is discussed in subsequent sections.
B. Affiliation process : Each affiliated institute requires annual affiliation processing which requires filling up forms and institute data. Such a process can be made computerized by online filling of affiliation form and authenticating the form by use of digital signature. Affiliation fees can be paid online to university which is the improvement over manual process. Automatic report can be generated and acknowledgment be sent to the institute after the completion of affiliation process. Here again improvement over manual processing where printed documents files required to be submitted and should be kept in table or drawer or cupboard which requires more space but a powerful server is capable of storing the same files for many years and archived for later reference. Thus automating affiliation process save time, costing, space and increase the reliability as there are less chance of missing files or documents if properly organized.
C. Admission processing : Each year hundreds of students take admission to university and affiliated institutes. By automating the admission process similar to affiliation using online filling forms, conducting online examination, producing result and generating merit list and giving student a chance to select the choice of available admission based on the merit. It requires primer knowledge of computer to fill the form and simplifies the admission process.
D. Enrollment processing : After completion of admission process the next process of enrollment of admitted student can be perform similar to both of above processes, Generated enrollment numbers are used to uniquely identify the student and searching. Proper database should be designed so that the same database can be used in multiple applications.

E. Education processing : Live lectures as manual lecture has major impact for direct communication with the students. But with better internet speed and use of video conference make distance education process far better. Live interaction with question answer session improves the learning process. Recorded video lectures may be available as offline so students can learn as per their convenience. Students can use latest mobile technologies to utilize the mobile facility to solve certain complex problems. Mobile as smart phone and accessibility of internet is now common so eBooks are easily available. Although class room teaching learning can not be replaced but technology adds into learning process. Use of simulation software that explains the working mechanism of any model, concept or any real industrial process. Use of video makes learning interesting. Online experimenting using computers and graphical system, tutorial, problem solving, industrial level standards and demonstrating theoretical aspect via practical makes understanding process far easier.

F. Availability of Internet : Campus of university should provide wireless access to internet which is the way to communicate with university and gain access. Smart applications are available keeping watch on proper internet usage and utilization in research area. Cloud computing is a solution to work from anywhere anytime but should be implemented with security criteria.

G. Online Examination process : Examination can also be implemented as online. Multiple choice questions are widely used as online examination where student identity is most important. MCQs can be used with OMR or OCR techniques. MCQs can test only objective type of knowledge but to test subjective type knowledge one word answer, fill in the blanks, match the pair and definition like questions should also be included. To implement complete subjective type test requires more effort and is the problem of research area which requires to build robust knowledgebase and expert systems with more processing power computers. At some extent it can be implemented. Some graphical interface should be provided to draw necessary figures and diagrams. This will reduce the use of papers and simplifies the answer book assessment processing.

H. Assessment of Answer sheets: Computers are also utilized today for assessment of answer books. Random answer sheets can be allotted to teachers. MCQs like questions can automatically be evaluated directly or OMR and OCR techniques but subjective type answers require specialized software systems. Such automated systems save amount of teacher time that can be utilized in teaching learning process. Also the evaluation in being performed error free and equivalent assessment for all the students. Subjective type assessment is more challenging. Assessment of student viva can be made online through video conference or manually using presentation, question answering and demonstrating working of proposed model.

I. Result Generation and Declaration : Result can automatically calculated and generated. Declaration of result can be made available through website or notified by message services of mobile or mailing system. Also result history is available online to view any result at any time. Printed result can then be issued. Reassessment of papers can also be made online. Thus Result declaration process will be fast enough.

J. Online Financial Transaction : Online banking and financial transactions saves time for different fee payment, remuneration, monthly payment and grant distribution. Online transactions reduce the use of cheques, demand drafts and paper work.

K. Miscellaneous : All the announcement, curriculum syllabus, circular, news, schedule, departmental information and website, crucial decision, staff profile, student information, result analysis, college information, online help system should be provided to each different level user by providing login id and password if necessary to gain access of critical data.

IV. Implementation of Green University

Basic necessary tasks performed by the university by automation of various processes were discussed. Now how green technology has an immense impact on Green University is described in following section.

A. Energy consumption can be saved drastically by adopting low energy passive house building standards in the university infrastructure [2].

B. Use of advanced technologies areas has direct impact on the society by applying skills and knowledge in innovative research [2].

C. Applying paperless class room learning, assignments submission and cost saving technologies for moving green towards saving environment [3].

D. Use of emerging technology should be made carefully as degree of uncertainty is associated with it, as new technologies have to prove themselves as successful. Scrutinized analysis should be made before implementation or parallel old and new technology should be used for better estimation [4].

E. Many impacting parameters like technology diffusion, health, agriculture, green environment, telecommunication, energy sources, building, mobility, materials, and quality standards for long run should be considered politically, technically and economically which impact the Green University [5].

F. Use of Green cloud computing solution reduces the cost and carbon emission for pollution free environment while increasing the revenue by providing storage, computations, software services using internet. Again security concerns carefully implemented for adopting cloud technology [6].

G. Use of Green IT for increased productivity, information access, low impact computers, materials and devices, energy reduction for data storage and computers, better maintenance and solution of e-wastage solves many environmental issues. Reduce use of papers and energy consumption by LCD/LED monitor has direct effects on environment [7].

H. Use of emerging technologies, e-textbooks, simulation technology, game-base learning, flipped classrooms, active learning class rooms, Massive open online courses, collaborative distance learning, active learning forum, e-learning and use of cloud services in higher education add in learning process [8].
I. Understanding and implementing green growth theory and applying it in practice for moving towards the green economy [9].
J. Use of environmentally sound technologies like renewable energy sources of solar, bio-fuel, hydrogen cell and wind can be implemented, Carbon capture and storage, clean coal technologies, power grid energy storage, Green building add toward building of Green University[10].
K. Use of Green Nanotechnology incorporated with Green chemistry and Green Engineering helps environment friendly innovations in research area [11].
L. Obtaining green economy by opening the job employments scope for the students while keeping watch on environment in the area of green building, green manufacturing like wind turbine manufacturing and solar panel installation energy sources [12].
M. Green computing promotes the use of computers, hardware, network device and other peripheral devices in green and eco friendly manner [13]. Green computing involves material used for manufacturing computer devices, its maintenance and life-span, power consumption, wastage etc.
N. Applying the next generation energy generation technologies to meet the social needs at home, transportation, business, industry needs taking care of economical, environmental and security concerns [14].
O. University are employing green technology and by comparing energy consumption and utilization, carbon emission, waste recycling, building, food, water etc are used as key dimensions to measure the degree of green universities [15]. According to analysis study ranking are assigned for being as Green University. Designing of green lab with environment friendly equipments adds more to Green University.
P. Building University infrastructure, designing and developing should be made by considering local eco friendly resources and material available, local climate conditions, water purification, rainwater harvesting implementation of solar panel, road construction and planning for wastage removal are key points for establishing Green University [16].
Q. Green University with Innovative Green Technology having research and its implementation, patent protection may not be optimal solution for encouraging using of this new technology area but it can be encouraged by using wide range of green technology options, its availability, its reach-ability to other institutes and other Universities [17].
R. Moving towards Green University requires transformation to change and adopt arrival of new technologies. University makes base for the people to build educated society which will have direct or indirect impact on social, economical, political, educational, development and many more areas of society. Education is a holy process and responsible for the future of the country. By adopting the Green technology at University level will have effect as overall to the society. The change is required to start transforming and applying green technology with a great vision and considering budget plans [18].
S. Applying green technology for further university building and infrastructure which is more energy efficient and have less impact on natural environmental. The technology incorporates smart lighting, passive light, motion sensor light, natural light and use of less harmful chemical for building and maintenance of the university [19].
T. Plan for designing and initiating the Green University should be established by involving all concerned with University. An annual environment reports should be generated with expected baseline to measure the success. Also how other universities have implemented and got successes should be studied and analyzed in environmental and its impact to research, development and educational aspects [20].
U. It is suggested to use energy star labeled product, avoid using of screensaver, brightness of monitor should be as per need, avoid informal disposing of computers and batteries and recycling of hardware to produce new one all are necessary aspect to impose Green computing to achieve Green University [21].
V. Green Technology innovation is used in manufacturing process of various production of steel, paper, motors etc and use energy efficiently and use carbon capture and storage for less pollution effects on environment [22].
W. Environment improvement can benefit resource productivity [23].
X. Use of Green computing by telecommuting means work from home job reduces billion of vehicle travelling miles [24]. Due to the advanced in technologies it is possible to monitor, control and obtain expected throughput while working at home.
Y. Google's Green computing offers cloud-based email system which reduces the energy usage. Also it suggests the housing and cooling solutions of cloud email servers and large data centers [25].
Z. Green computing provides the way to sustain the global warming environmental problem by adopting key aspects of it and implementing to green university as whole [26].

Thus implementation of Green University requires more efforts. Further planting more trees and greenery at university campus with above efforts being applied makes true Green University in real sense. Such a university creates an educational atmosphere that can be realized as learning as enjoyment and interesting. All of us learner and Green University adds positive energy in learning process. Maintenance of Green University with adoption of proper technology will take care of

environment and human empowerment that will build Green Society.

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V. Conclusion

Green University establishment has been started by many countries in the world. As it is difficult to implement some of the aspects like online subjective examination and automatic evaluation but research is going on in this direction. Computers and their usage have greater impact on functioning of Green University. Green University once initiated then other universities, institute and industries will be influenced towards applying Green technologies. It is a long term process and requires time for effective outcome. We all together requires to follow small things to implement at large scale to achieve Green University.

Green University application requires planning, analysis, designing and implementation with baseline criteria to meet accepted standards. It will help to survive our only home planet environment where the living is possible in the universe up to now. Its our moral responsibility and duty to take care and maintain our nice earth. Nature has its own low and we must try to follow the rules that will help the nature and the first step in this direction may be the implementation of Green University.

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