Abstract

Every year a huge amount of paper is being used in Thesis/Report Submission in the Universities. Interestingly, a huge portion of these bulky paper works are simply discarded because it contained errors or due to inappropriate formatting. And the resubmission process is not only time consuming but also wastes a huge amount of paper. Storing these documents also requires a larger space, thus few proportions is kept. It is not only waste of space and resource but also has a negative impact on the environment. And also, sometimes the owner loses the documents after a long period of time, which is another issue. A large amount of greenhouse gases is being released during the processing of paper.

In this world of growing technology, it has now become more meaningful to store a digital version of these documents. Day by day more and more organizations are incorporating "Go paperless" concept because not only does it makes storing documents easier and reduces the chance of losing them but also contributes towards a greener environment.

To solve the aforesaid problem, we propose a convenient, secure and more efficient, “Greener” solution that reduces the carbon footprint of academic document management system. Precisely, would allow online submission and storage of these important documents such as thesis, reports, institutional materials etc. and would also ensure the exact formatting and other aspects of the documents prior to submission.

Introduction

Learning Materials and Scholarly Documentations are the integral parts of any educational procedure to successfully assist the learners to achieve the learning objectives and asses their understanding and inclusion in a particular subject. The readiness of any scholarly documentation is the ideal method to invigorate the information regarding that particular topic and also ensures that the learners can work with this information, direct logical research or lead and examination. Managing all these important documents, while ensuring security and availability is undoubtedly a daunting task that most of the educational institutes have to perform. The proposed method in this research describes an online management system to securely and efficiently manage these huge resources which is very convenient for both the institutes and the learners, easy to maintain, environment friendly and also the same time affordable.

A Closer Look at the Existing Approach

**Thesis or Report Submissions:** Writing a high-quality academic paper is a matter of hard work, including extensive research and looking for reliable and confirmed sources for information, preserving the professional academic claim, reviewing the research being conducted and drawing conclusions. Every year a huge amount of these scholarly compositions or thesis papers are being submitted in the Universities in Bangladesh as part of the educational procedure. But most of these papers are either discarded due to errors, become obsolete over time, or are lost. Storing these large amounts of papers also require quite huge amount of space, and are also inconvenient to carry around. Also, the preparation phase of these papers requires lots of papers as multiple drafts are required to be created and revised in order to compose the final version; and all of which are straightly thrown away.

**Institutional Materials**: An all in one platform for institutional materials or learning materials of an educational institute is still absent in our country. Most of the universities in the country rely on delivering learning materials to the students either by using hard copy of the notes, using third party management applications, or by using flash drives. It becomes increasingly difficult to store or maintain all these course materials as they pile up and therefore are also easily lost. It can also become difficult to obtain the materials in the first place in case someone misses a lecture. Sometimes, higher level courses require reviewing of the materials taught in a previous course, and being not able to find those when needed further add to the inconvenience. Students also do not have a dedicated discussion forum where they can easily start a discussion with other students about a particular topic.

How Environment Friendly are these?

Papers are mostly made out of trees and around 40% of the world’s commercially cut trees are being used for this purpose. The pulp and paper industry are also major contributor of deforestation as over 30 million acres of forests are being destroyed annually. Paper production also requires a huge amount of water. Production of a typical A4 paper requires about 10 liters of water. Moreover, most of the materials found in landfills are papers. In fact, the lifecycle of papers produced this way is damaging to the environment from the beginning to the end; it requires cutting down of trees to produce the papers, and when papers rot, they produce methane, a greenhouse gas, or carbon dioxide when burned or composted.

Paper manufacturing is the third largest user of fossil fuels worldwide according to the American Forest & Paper Association. Although recycling paper or using tree-free paper can help decrease the environmental impacts, most paper still end up in the landfills. Paper production also causes air pollution as it releases nitrogen dioxide, sulfur dioxide and carbon dioxide during the manufacturing process. Nitrogen dioxide (NO2) and sulfur dioxide (SO2) are major contributors to acid rain, whereas carbon dioxide is a greenhouse gas responsible for climate change. Waste waters discharged from pulp and papers mills contain solid, nutrients and other dissolved organic pollutants.

The carbon footprint of a product is usually defined as a quantification of Green House Gases (GHG) emissions during the lifecycle of the product and is being increasingly applied for multiple purposes. And Equivalent Cardon Dioxide CO2 eq is used to estimate how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO2) as the reference).

There are approximately **890078** university students in the country. A complete Thesis paper contains **60-70** pages. If each student has to submit one thesis paper each containing **60** pages, then 890078 students will submit 890078 thesis papers containing: **60 \* 890078** pages = **53,404,680** pages or sheets.

**4.64**g of CO2eq produced for one page. One of these thesis papers produces **4.64 \* 60** = **278.4**g CO2eq.

Therefore, all **53,404,680** produce:

**53,404,680 \* 4.64** = **247,797,715**g CO2eq which is approximately 248 tons CO2eq each year.

A typical 80GSM A4 paper weighs **5** grams. Therefore, all **53,404,680** pages weighs: **53,404,680 \* 5** = **267,0023,400** grams which is approximately **267** tons.

The thickness of a typical **80GSM A4** paper is **0.1** mm, and measures **0.21**m by **0.297**m in width and height.

Therefore, volume of 1 paper is:   
**0.21 \* 0.297 \* 0.0001** = **6.24 \* 10e-6** cubic meters. Thus, volume of all these papers combined is:   
**53,404,680 \* 6.24 \* 10e-6** = **333.24** cubic meters.

Meanwhile, a large group of networked computer servers are typically used by organizations for the remote storage, processing, or distribution of large amounts of data. Every large organization depends on vast arrays of servers to run applications, support electronic communications, and provide productivity tools. But building and operating the data centers facilities required consumes ever-large portions of technology budgets and contributes to greenhouse gas emissions. For some information-intensive businesses, data centers represent half of the corporate carbon footprint. This is also consistent with the fact that data centers consumed approximately 1.5 percent of the total electricity produced in 2012. However, the development of “cloud computing” has a beneficial influence on energy consumption by sharing processors and other hardware, to avoid data centers being grossly underused as in the past. The proliferation of cloud computing has promoted the wide deployment of large-scale datacenters with tremendous power consumption and high carbon emission. To reduce power cost and carbon footprint, an increasing number of cloud service providers have considered green datacenters with renewable energy sources, such as solar or wind. The proliferation of cloud computing services has promoted massive-scale, geographically distributed datacenters with millions of servers. Large cloud service providers consume many megawatts of power to operate such datacenters and corresponding annul electricity bills are in the order of tens of millions of dollars-such as Google with over 1,120 GWh (Gigawatt hour) and $67 million and Microsoft with 600 GWh (gigawatt hour) and $36 million. Reportedly, datacenters now consume about 1.3 percent of the worldwide electricity and this fraction will grow 8 percent by 2020. High energy consumption not only results in large electricity cost, but also incurs high carbon emission.

In the United States, generating 1kWh (kilowatt hour) of electricity emits about 500g of equivalent carbon dioxide on average. Each 100MW (megawatt) power station will cost $60-100 million dollars to build and emit 50 million tons of equivalent carbon dioxide during its operation. As a result, IT carbon footprints currently occupy 0.2 percent of global greenhouse gas emissions. To measure how clean is a datacenter, the Green Grid organization proposes a new sustainability metric, carbon usage effectiveness (CUE), to measure carbon emission associated with datacenters, CUE is defined as CUE = Total CO2 Emission caused by Total Datacenters Energy/IT Energy Consumption. The units of the CUE metric are kilograms of carbon dioxide equivalent (kgCO2eq) per kilowatt-hour(kWh). The renewable energy sources have less carbon emission rate than fossil fuels such as coal, gas and oil. Large IT companies have started to build datacenters with renewable energy, such as Facebook’s solar-powered datacenter in Oregon and Green House Data’s wind-powered datacenter in Wyoming.

Power Usage Effectiveness (PUE): The data center industry uses the measurement PUE of 2.0 means that for every watt of IT power, an additional watt is consumed to cool and distribute power to the IT equipment. A PUE closer to 1.0 means nearly all the energy is used for computing. However, it has an indirect impact on CO2 emission.

For example, the annual PUE of all the datacenters of Facebook in the year 2018 was: 1.11. The operational greenhouse gas emission of those in the same year was: **314,000** tons CO2eq. Though this number is still very large, but it has to be taken into account that how enormous Facebook’s datacenters are. To compare, it is estimated that the book industry in the UK alone produces about 1.8 million tons of CO2eq respectively.

Besides Facebook Datacenter reducing Carbon dioxide emission, Google Datacenter now took the challenge to source carbon-free energy to match the electricity consumption.

Now, moving back to the paper based systems, the important term that most organizations using paper-based processes face is security risks due to paper documents that have (a) been lost, (b) been damaged, (c) been misfiled, or (d) fallen into the wrong hands. In 2011 from various sources it was found that “more and more companies and organizations are making the shift toward electronic filing, saving space and increasing security. Large computer servers have the ability to store mass quantities of information in a secure state and location. Digital documents stored on these servers can be easily retrieved within minutes, which increases employee productivity due to the elimination of the chore of searching for misfiled physical documents (Paperless Office, 2009, p. 16).

Collaboration efforts using paper documents prove challenging at times. Employees cannot easily distribute or share paper documents compared to their digital counterparts (Welsh, 2007, p. 11). Organizations that have replaced paper-based processes with paperless processes performed on a computer or other device enjoy greater flexibility with digital documents. “Digital documents are easier to search, share, and backup than paper documents, and they take up essentially no space” (Kissell, 2013, p. 77). Stratton (2013) notes “electronic files allow better access and information sharing, cost less in terms of physical space and personnel, and can increase productivity—all of which add to the bottom line” (p. 44).

An Alternate Perspective

As the advancements in technology has provided us with the opportunity to have a plethora of ways to make more robust and convenient systems that are not only more efficient and convenient, but also ‘greener’ and affordable, it is the next natural step to incorporate those changes into this field also. Everyday more and more organizations are trying to incorporate “Environment Friendly” systems as people are becoming more aware. Organizations and offices are incorporating paperless management systems to help reduce the carbon footprint, and these systems also provide a very easy and reliable management solutions compared to the systems that relies on papers.

Therefore, this project focuses on creating a thesis paper submission and learning materials management system as to contribute towards a “Greener” environment, and also to provide with a reliable means to store and manage these important documents. This system would produce negligible carbon dioxide emissions compared to the current systems that are primarily dependent on the usage of papers. This system would allow the students to submit and store their papers online. Additionally, the system would let the students know if their written documents violate any formatting rule provided by their teachers. Once submitted the teacher can view these papers online. Not only this would help reduce paper wastage but would also make the document submission process more convenient and also the students would be able to find their documents in one place pretty easily without worrying of losing them. And moreover, teachers could also use this system for all their document submissions, and thus would be able to keep track of all of them very easily.

Thus this system would not only help to reduce the carbon footprints due to paper usage discussed earlier, but also would provide its users with a hassle-free and seamless experience, and would also ensure that the students would not require to worry about where these very important documents are, in the future, and would be able to find them all in one place.