# Paperless Thesis Submission

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***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 etc. and would also ensure the exact formatting and other aspects of the documents prior to submission.**

***Keywords—paperless, thesis, submission, format-checking, environment-friendly, Go-Green***

## I. Introduction

Scholarly composition is a fundamental part of any learning procedure so as to empower instructors to assess every understudy's degree of comprehension and inclusion in the subject. The readiness of any scholarly paper is the ideal method to invigorate the information regarding the matter and guarantee that understudies can work with this information, direct logical research and lead an examination. Writing a high-quality academic paper requires hard work including looking for reliable and confirmed sources, preserving the professional academic claim, reviewing research 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.

Papers are mostly made out of trees and around 40% of the world's commercially cut trees are being used for this purpose. [1] 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. [2] 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 ($NO_2$) and sulfur dioxide ($SO_2$) 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 $CO_2$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 ($CO_2$) as the reference ). [3]

Using increased amount of paper means cutting down of more trees. It also requires transportation and processing. A single piece of paper releases **4.64g** of $CO_2$eq (equivalent carbon dioxide) (both in carbon emitted during processing and carbon that could have been sequestered if the trees had remained alive). [3]

There are approximately **890078** university students in the country. [4] 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 $CO_2$eq produced for one page. One of these thesis papers produces **4.64 * 60** = **278.4**g $CO_2$eq.

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

**53,404,680 * 4.64** = **247,797,715**g $CO_2$eq which is approximately 248 tons $CO_2$eq each year.

A typical 80GSM A4 paper weighs **5** grams. [5] 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 [6], 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 $CO_2$ Emission caused by Total Datacenters Energy/IT Energy Consumption. The units of the CUE metric are kilograms of carbon dioxide equivalent ($kgCO_2eq$) 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 $CO_2$ 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. [7] 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 $CO_2$eq respectively. [8]

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).

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 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.

## II. LITERATURE REVIEW

### A. *Integrated Cloud Storage on Paperless Thesis Examination [9]*

The advancements in technology has digitized almost all aspects of the present world. And the Internet is one of the most influential advancements in technology. And cloud computing has become one of the trends now. Many organizations are now incorporating cloud computing systems to provide a seamless, efficient and "Greener" management systems.

Paper consumptions results in increased cutting of trees and thus contributes to Global Warming. And with the advancements in technology it is now possible to think about alternative to help reduce the usage of paper, and make a "Greener" and sustainable environment. As people are becoming more aware, more and more organizations are trying to help contribute towards a solution to this issue.

Paperless thesis examination system is one of the systems developed in cloud computing. Many universities are now using internal servers to store these documents. This paper discusses the design of a thesis examination system integrating cloud storage to increase efficiency and help towards producing a lower carbon-footprint.

Many researches are going on to improve the quality of thesis examination systems like this. And based on a review of these systems, the popularity of the cloud storage has not been implemented into this sector yet. And this proposed system tried to focus on this particular aspect.

The proposed system would focus on student activities during the thesis document uploading process. Each student is required to have a cloud storage account to access the service. The system would integrate that cloud storage account with the academic information system account, so that it does not require an additional account registration process. The system would only focus on the registration and uploading of the thesis examination. Activities are available to a student in this system include access to information and thesis examination requirements, filling out forms, uploading documents and viewing thesis examination schedules and the examiners.

Lectures and supervisors would only be able to see the examination schedules and download the thesis document submitted by the student.

In conclusion, with the help of advancements in technology, systems are being developed to incorporate digital thesis paper submission system into the universities, and many researches are ongoing to help improve this sector.

This document provides with a unique idea of incorporating a cloud storage account with the university system account for the thesis examination submission and storage. The user would require to have a cloud storage account for being able to upload or download the thesis document and the document would be stored in the cloud storage account instead of the internal servers of the university.

### B. *Journal Review on Paper wastes [10]*

A research on paper waste management was conducted by U. Arena on paper title "Environmental Assessment of Paper Waste Management Options by Means of LCA Methodology".

In this paper, they had used to assess and compared the environmental performances of three alternative options (land-filling, recycling, and combustion with energy recovery) that could be used in Italy to manage paper and board packaging wastage. In this specific case, they showed that paper use should be viewed in the context of the international trade in bio-fuels.

Scenario on Waste Management: In the recycling scenario three represents the reference case, with the other two scenarios defined by their differences from this scenario. Scenarios a and c were represented by the best available technologies, to represent a possible new investment in alternatives to scenario b. In each scenario, the paper waste management sites (land-filling, recycling, combustion with energy recovery) are located in Italy. Paper production from virgin fiber is located in Sweden (where most of the fiber used in Italy is produced) and includes sericulture and harvesting, debarking, and chipping. The burdens related to the transportation of virgin fiber, from Stockholm to Rotterdam by ship and from there to central Italy by train, are also incorporated.

**a. Landfilling**: This situation covers the collection of 1.17 t of paper waste and its transport to a landfill, as nicely as the traditional manufacturing of 1 t of packaging paper from virgin fiber to provide the product made by recycling in situation b. A trendy landfill is considered, with excessive integrity bottom and top membranes for leachate containment, leachate therapy with the aid of reverse osmosis, high effectivity (55%) of biogas collection, and 60% of the accrued biogas burned in a fuel engine with an electrical conversion efficiency of 35%. The ultimate 40% of amassed biogas is flared to convert hydrocarbons to carbon dioxide and for this reason reduce its greenhouse warming effect. sixteen The amount of leachate produced used to be estimated to be 400 dm3/t of paper waste landfilled over a duration of 30 years: the price basically depends on local rainfall, the integrity of the sealing of the landfill, and the

Original water content of the buried waste. The conservative assumption was once made that the composition of the liquid effluent just met regulatory requirements. Biogas production was estimated to be a hundred and twenty standard cubic meters (at a reference temperature of 20 °C and 1 atm) per ton of paper waste. 15 The primary components of the landfill gasoline are methane, usually 50-55%, with the balance being often carbon dioxide plus less than 1% of hydrogen sulfide and different natural compounds. The time scale for quantifying the leachate and biogas

Emissions is related to the time required for the landfill to end up wholly mineralized, that is, 30 years.

**b. Fiber Recycling**: The recovered paper processing system varies in accordance to the paper grade to be produced and the kind of waste paper used. Recycled fiber (RCF) approaches can be divided into two main categories: (1) techniques with mechanical cleaning and deinking, which produce recycled products such as newsprint, tissue, printing and replica paper, magazine paper, lined board and carton board, and (2) processes with solely mechanical cleaning, i.e., without deinking, which produce down-cycled products such as test liner, corrugated medium, uncoated board, and carton board. All the strategies intention to separate paper fibers from impurities and contaminants by way of deliberation, deflating, and elimination of impurities. The procedure waft layout of the RCF mill, devoted to the coaching of secondary fiber packaging paper and board (i.e. recycled product), which has been used as the reference system for this study.

During the pulping stage, coarse rejects are separated, while in the successive multistage cleansing and screening tiers heavy particles, flat contaminants, stickiest, and exceptional sand are removed, main to deflating of the stock to supply suitable optical homogeneity. The review by EIPPC1 small print all the direct environmental burdens associated with this type of mill (Figure 6). The operations from entry to the foreground up to the RCF mill differ between distinct kinds of waste. For example, carton boards accrued from supermarkets and process scrap from paper manufacture require no sorting, only packing and transportation. However, some aspects are

Common to all wastes and products: all solid waste from sorting stations is routed to landfill (modeled as in scenario a), whereas waste from reprocessing is taken as 50% landfilled and 50% burned with power recovery (as in state of affairs c).As stated above, the complete recycling chain was once modeled for every of the most important Italian commercial products with the particular waste used for its production.

**c. Combustion with Energy**: Recovery This situation covers dedicated combustion of 1.17 t of accumulated paper waste with recuperation of electrical energy dispatched virtue distribution grid and consists of traditional manufacturing of 1 t of packaging paper in Sweden (Figure 4). A net calorific fee (LHV) of thirteen MJ/t has been evaluated on the groundwork of the composition of the accumulated waste. The waste-to-energy unit consists of three sections: combustion, strength recovery, and flue fuel treatment. A cellular grate furnace is the predominant factor of the combustion section. The strength recuperation section is assumed to have a conversion effectivity of 27.7%, which is high however possible with a modern day plant. A semidry scrubber for acid treatment, a fabric filter for casting off fly ashes, and selective catalytic reduction to reduce NOx and organic micro pollutants comprise the flue gasoline treatment. Final gasoline emissions are assumed to be those conceivable with perfect operation of these best available technologies and are well within regulatory limits. The inventory additionally takes into account all the environmental burdens associated to the conditioning of ashes and their disposal.

## III. PROPOSED METHOD

The proposed system would consist of a centralized database and server to maintain and store the submitted thesis papers. The system would not only help to store the thesis papers but would also perform checks on the document formatting to identify whether it is correctly formatted and plagiarism checks prior to submission, which is quite unique up until now. Students and teachers would have their respective accounts with students being able to submit, store and view the thesis papers and teachers would be able to view those thesis papers or upload the templates which would be used for the format checking.

Each student is required to have an account to use this service. To create an account, a student must fill up the form provided by the system, with the student identification number provided by the University. Internally, the system would validate the request by acquiring information from the university server and create a new account. Registered students would then be allowed to use the services provided by the system. As mentioned earlier, each student would be allowed to submit a new thesis file, revise the submission upon requirement, and view submitted thesis files.

Similarly teachers would also require to have their respective accounts, and to create an account, a teacher is also required to fill up the respective form provided by the system, where they would require to provide with the teacher identification number provided by the University, and after a successful validation, the new account would be created. Teachers would be able to upload template files, which the system would use to validate the format of the document, and they can also verify any thesis paper submission requested by a student, and view the thesis file any time after it is successfully submitted by a student.

After a student has uploaded a thesis paper for submission, the file would first be stored into a temporary storage in the server. The system would then compare the format of the submitted document with the template uploaded by the teacher or the department for the particular submission, and then notify the student of certain errors, if there is any, otherwise the system would send a confirmation request to the concerned teacher. The document can be revised any number of times during this period. After a successful validation from the teacher, the document would then be permanently stored into the server. During this process, a digital signature would be attached to the document for authenticity. Any revision of the document from this point onwards would require passing through the above-mentioned steps again.

The students would be able to view their submitted thesis papers for free for a limited period of time. But teachers would always be able to view the papers those were submitted to them.

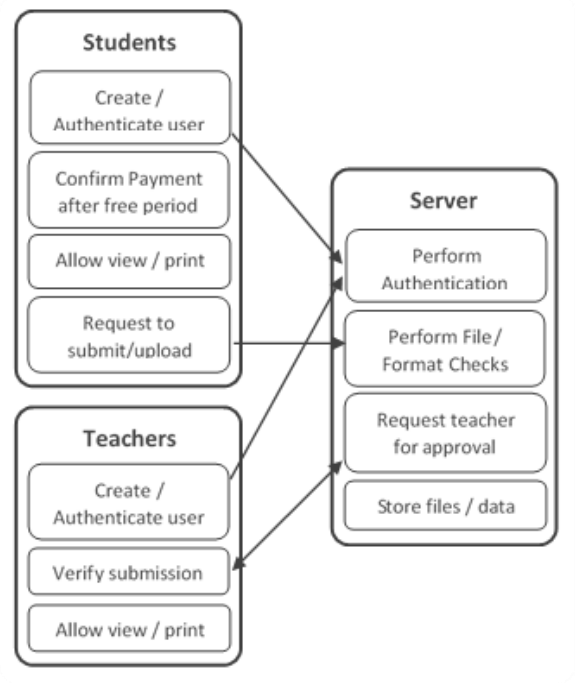


Fig. 1. A simplified view of the proposed system.

## IV. Tools

The system would be implemented using HTML, CSS, JavaScript, Python, Django (Python-Web Framework).

Since the system would be implemented using the Client-Server architecture, using a web application would ensure an easier solution for a wide variety of devices. Only a device with a working Internet Connection and a Web-Browser would be required to use this service.

HTML5, CSS3 and JavaScript would be used to build the client side of the application. The user interface would be a responsive interface to ensure a seamless experience across most of the devices. The server side would be built using Python (Django).

Python is one of the most used Programming Languages that are being used now, due to its strong emphasis on readability and efficiency compared to other languages like PHP. It is very easy to learn compared to many other languages and many complex functionalities can be implemented with very few lines of codes. Apart from that, Python is also very flexible, that is, it has several robust integrations with other programming languages. For example, CPython - integrated with C, Jython – integrated with JAVA and so on. And since, it is quite popular among the programming community, it offers a wide range of resources or packages.

Python also offers a very high-level web-framework, Django, that encourages rapid development, and clean and pragmatic design. It is very robust, extremely fast and secure, and also very scalable all at the same time. Organizations like Instagram, The New York Times, The Guardian, MIT, NASA, National Geographic and many more have incorporated Django into their systems. [11]

This system would incorporate Django to maintain the server, and Python-Docs module for the word document handling.

## V. Project Timeline

The implementation of the proposed system mainly consists of four main phases: *Front-end or UI, Back-end or Server, Document Processing for checking validation, and Testing phases*. Below is a proposed timeline of the work flow.

- **Month 1**: Data collection, learning required dependencies (if required), and development of the front-end / UI, and creating Thesis document Templates. (Consisting usage of HTML, CSS, JavaScript, and also Microsoft Office Word for creating document templates).
- **Month 2**: Development of the back-end / server-side application, and development of modules for document processing. (Consisting usage of Python (Django), and Python-docs mainly for document handling).
- **Month 3**: Testing and finalizing. (Though we would focus on Test Driven Development procedures).

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